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Lewis Acid-Driven Meyer–Schuster-Type Rearrangement of Yne-Dienone

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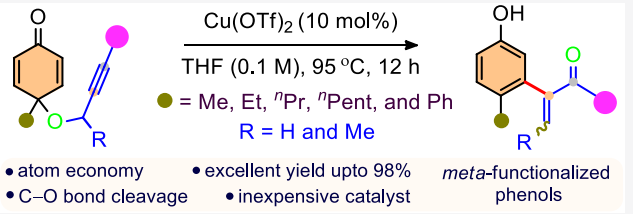
ABSTRACT: Developed herein is a Cu(II)-catalyzed Meyer–Schuster-type rearrangement of alkyne-tethered cyclohexadienone for the construction of *m*-enone-substituted phenols. The reaction involves an uncommon 5-*exo*-trig 1,6-enyne cyclization of alkyne-tethered-cyclohexadienone, aromatization-triggered C–O bond cleavage, and an electrocyclic 4π-ring-opening of oxetene intermediate. This atom-efficient transformation provides access to a wide range of synthetically important α-(*m*-substituted phenol)-α,β-unsaturated ketones, featuring a broad scope with labile functional group tolerance. The gram-scale demonstration makes this transformation synthetically viable. The synthetic application of α,β-unsaturated ketones is also showcased.

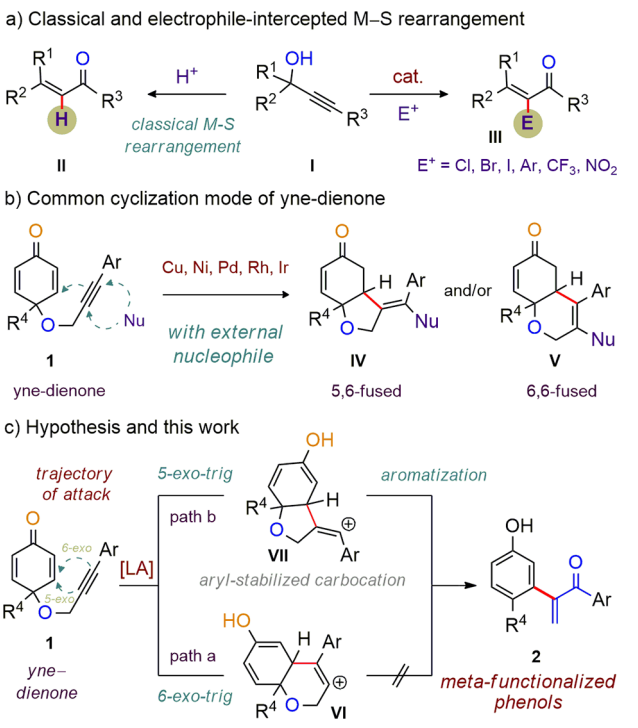


INTRODUCTION

Propargyl alcohols have been largely used for the development of novel synthetic transformations and the fabrication of complex molecular scaffolds.[1,2] In this regard, the atom-efficient conversion of propargyl alcohol **I** to α,β-unsaturated carbonyl compound **II** is a trustworthy testimony of the classical Meyer–Schuster rearrangement (MSR; Scheme 1a).[3] This transformation primarily involves an acid-catalyzed 1,3-hydroxy shift and tautomerization sequence of propargyl alcohol (Scheme 1a). Over the years, new variants of electrophile-intercepted MSRs have been developed, and their synthetic potential has been significantly widened.[4,5] Thus, transition-metal (TM)/Lewis acid (LA)-catalyzed halo/aryl/CF_3/NO_2-intercepted MSRs have led to diverse arrays of α-functionalized enones (Scheme 1a).[5] Among all, the aryl-electrophile (available from the respective boronic acids, diazonium salts, hypervalent iodine complexes, etc.)-intercepted MSRs of propargyl alcohols are noteworthy, leading to highly functionalized α-arylated enones (Scheme 1a).[5d,e] However, such transformations are possible in the presence of external electrophiles, expensive metal catalysts, and ligands.

Along this line, yne-dienones **1** are unequivocally important as these moieties have been largely used for the development of novel synthetic methods and the construction of unusual fused heteroaryls.[6] In this line, the transition-metal (TM)-catalyzed arylative/borylative/silylative/reductive and acetate-triggered cyclizations of yne-dienones are most significant (Scheme 1b).[7,8] These reactions primarily happen via nucleophile/radical-assisted 5-*exo*-trig/6-*exo*-trig cyclizations of yne-dienones to make [5,6]/[6,6]-fused heterocycles **IV**/**V**, respectively (Scheme 1b).

Scheme 1. Previous Work and Current Hypothesis



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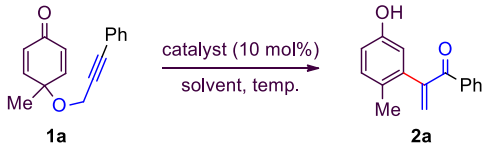
Further to the recent demonstration on the thioarylative radical cyclization of yne-dienones,[9] a Lewis acid-driven cyclization−aromatization−rearrangement cascade of **1** is envisaged (Scheme 1c). Inspired by the MSR of propargyl alcohols,[3a] the O-bridged alkyne-tethered-cyclohexadienones **1** in the presence of Lewis acid could undergo an intramolecular 6-*exo*-trig/5-*exo*-trig Michael attack by the tethered alkyne to respectively generate alkyl enabled vinyl carbocation **VI** and aryl stabilized vinyl carbocation **VII** (Scheme 1c). Next, aromatization of the stable intermediate **VII** with the concomitant cleavage of the C−O bond could form a strained oxetene species (see Scheme 6). Finally, rearrangement of oxetene could provide access to peripheral decorated *m*-enone-substituted phenols **2** [Baylis−Hillman−Basavaiah (BHB) type adduct],[10] which are otherwise difficult to prepare in a conventional synthetic method (Scheme 1c). Despite the broad synthetic transformations uncovered in MSRs, a detailed investigation on the current findings *α*-arylative MSR is yet to be explored in detail. During the preparation of this manuscript, a silver(I)-catalyzed and TfOH-mediated cyclization-aromatization cascade of alkyne-tethered-cyclohexadienone has recently been appeared.[11]

RESULTS AND DISCUSSION

To make the envisioned plan workable, 4-methyl-4-((3-phenylprop-2-yn-1-yl)oxy)cyclohexa-2,5-dienone (**1a**) was exposed to various Lewis acids (Table 1). At first, subjecting **1a** with $Sc(OTf)_3$ (10 mol %) in tetrahydrofuran (THF) at 85 °C for 12 h led to *α,β*-unsaturated enone rearranged product **2a** in 63% yield (entry 1). Screening other Lewis acids, $Yb(OTf)_3$, $Fe(OTf)_3$, and $In(OTf)_3$, provided **2a** in 73%, 54%, and 66% yields, respectively (entries 2, 3, and 4). To our delight, the compound **2a** was obtained in 75% yield when the reaction was conducted in $Cu(OTf)_2$ (10 mol %) at 85 °C for 12 h (entry 5). In the absence of catalyst, **2a** was not even formed (entry 6). The product yield was not enhanced when the reaction was carried out in $ClCH_2CH_2Cl$, 1,4-dioxane, toluene, and/or $CHCl_3$ solvents (entries 7−10). However, the reaction under the identical condition of entry 5 in 5 h affected product formation affording 30% **2a** (entry 11). The reaction at room temperature did not proceed (entry 12), whereas, at 60 °C, a trace of **2a** was detected (entry 13). To our delight, the reaction was clean at 95 °C providing access to **2a** in 98% yield (entry 14). Thus, rearrangement of **1a** was very smooth when conducted in the presence of $Cu(OTf)_2$ (10 mol %) in THF at 95 °C for 12 h (entry 14). We next scrutinized various copper salts and Brønsted acid catalysts. The reaction in the presence of 10 mol % CuOTf−toluene delivered the desired product in 64% yield (entry 15). Disappointingly, $Cu(MeCN)_4PF_6$ and CuCl catalysts were not suitable (entries 16 and 17). However, the reaction in the presence of Brønsted acids (TfOH and Tf_2NH) successfully delivered the product **2a** in 72% and 74% yields, respectively (entries 18 and 19).

The scope and limitation of the $Cu(OTf)_2$-catalyzed rearrangement of alkyne-tethered-cyclohexadienones **1** were explored, and the results are shown in Schemes 2 and 3. The rearrangement of **1a** (0.3 mmol) was smooth to afford 95% of **2a**. The electron-rich arenes (having substituents *p*-Me/*p*-OMe/*p*-^{t}Bu) on alkyne terminus of yne-dienones **1b−d**

Table 1. Optimization of Reaction Conditions[a,b]

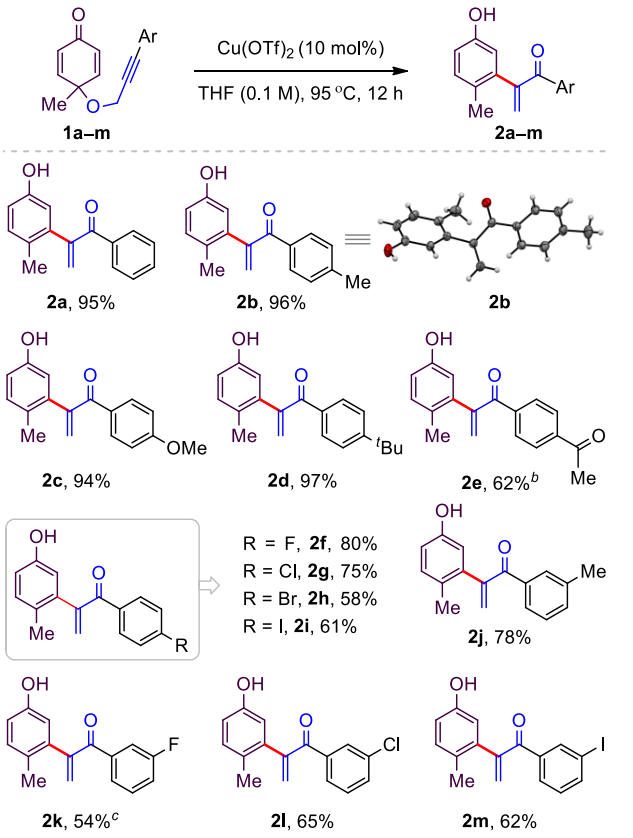


1a **2a**

entry	catalyst	solvent	temp (°C)	yield
1	$Sc(OTf)_3$	THF	85	63
2	$Yb(OTf)_3$	THF	85	73
3	$Fe(OTf)_3$	THF	85	54
4	$In(OTf)_3$	THF	85	66
5	$Cu(OTf)_2$	THF	85	75
6[c]		THF	85	no reaction
7[c]	$Cu(OTf)_2$	$ClCH_2CH_2Cl$	85	trace
8	$Cu(OTf)_2$	1,4-dioxane	85	42
9[c]	$Cu(OTf)_2$	toluene	85	no reaction
10[c]	$Cu(OTf)_2$	$CHCl_3$	85	trace
11[d]	$Cu(OTf)_2$	THF	85	30
12[c]	$Cu(OTf)_2$	THF	rt	no reaction
13[c]	$Cu(OTf)_2$	THF	60	trace
14	$Cu(OTf)_2$	THF	95	98
15[e]	CuOTf−toluene	THF	95	64
16[c]	$Cu(MeCN)_4PF_6$	THF	95	trace
17[c]	CuCl	THF	95	trace
18[e,f]	TfOH	THF	95	72
19[e,f]	Tf_2NH	THF	95	74

[a]Reactions were carried out using **1a** (0.06 mmol), Lewis acid (10 mol %), and solvent (0.1 M) for 12 h. [b]Crude NMR yield. [c]Observed by TLC. [d]Reaction stopped in 5 h. [e]Reaction was carried out using **1a** (0.3 mmol) and isolated yield. [f]Brønsted acid (20 mol %) was used.

Scheme 2. Substrate Scope I[a]



[a]Reactions were carried out using **1** (0.3 mmol), $Cu(OTf)_2$ (10 mol %), in THF (0.1 M; 3 mL) at 95 °C for 12 h. [b]Stirred for 36 h. [c]Unreacted starting precursor recovered.

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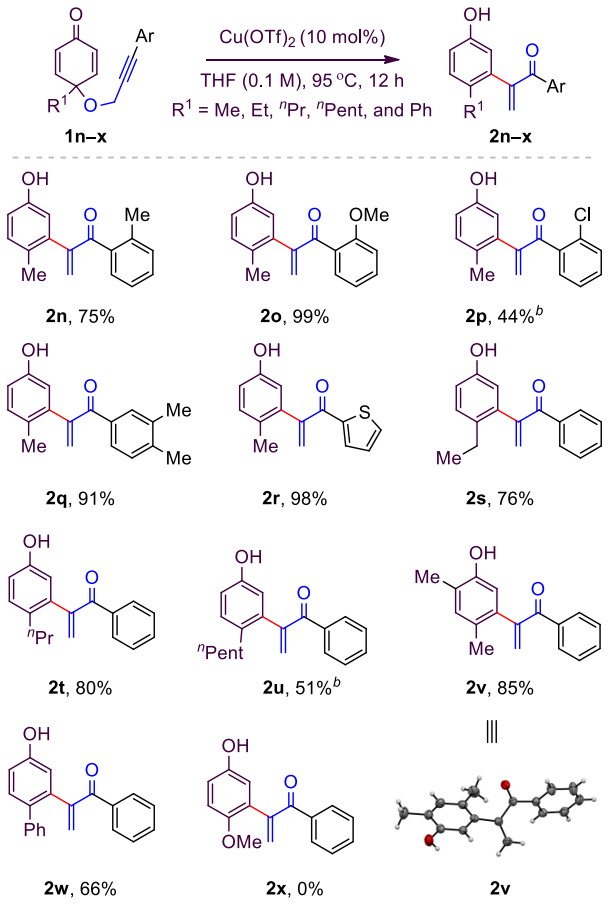
Scheme 3. Substrate Scope II[a]



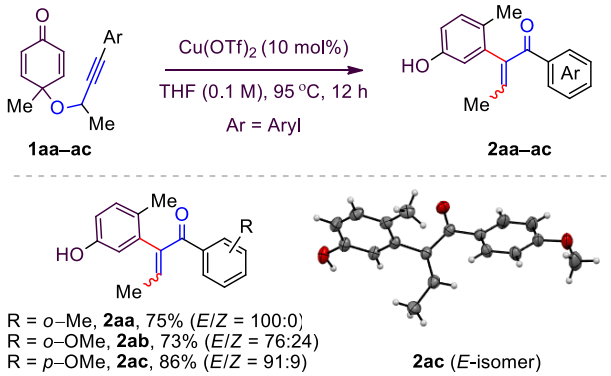
[a]Reactions were carried out using **1** (0.3 mmol), $Cu(OTf)_2$ (10 mol %), in THF (0.1 M; 3 mL) at 95 °C for 12 h. [b]Unreacted starting precursor recovered.

successfully underwent the cationic rearrangement to deliver the respective products **2b–d** in excellent yields (94–97%; Scheme 2). Although the reaction took a longer time, 36 h for completion, the desired product **2e** (62%) was isolated in a moderate yield from the electron-deficient *p*-COMe arene-enabled **1e**. Presumably, the substituent −I effect affects the stability of vinyl carbocation intermediates and the reaction productivity. Likewise, $Cu(OTf)_2$-catalyzed rearrangement of yne-dienones **1f–i**, having halo-substitution −F/Cl/Br/I on the *p*-position of arenes in alkyne terminus, provided **2f–i** in 58–80% yields (Scheme 2); the labile halo groups survived under the catalytic conditions, and hence, further functionalization of these groups is possible. The yne-dienones **1j–m** exhibiting *m*-Me or the transformable halo (*m*-F/*m*-Cl/*m*-I) at the arene moiety also reacted well to furnish the corresponding *meta*-substituted phenols **2j–m** in 54–78% yields (Scheme 2).

To further examine the effect of steric bulkiness in this cyclization–aromatization–rearrangement cascade, the reaction of alkyne-tethered-cyclohexadienones with *ortho*-substituted arene [*o*-Me (**1n**) and *o*-OMe (**1o**)] on the alkyne terminus was carried out under the optimized conditions that lead to **2n** (75%) and **2o** (99%), respectively (Scheme 3), whereas the transformable *o*-Cl arene-substituted yne-dienone **1p** delivered **2p**, albeit in a moderate yield. An excellent product yield of **2q** was isolated from **1q** (the *m*,*p*-dimethyl arene-substituted yne-dienone). The reaction was compatible with the heteroaryl-enabled yne-dienone **1r**, leading to 2-thienyl-bearing enones **2r** in a quantitative yield (Scheme 3). The alkyne-cyclohexadienone with various alkyl substituents at the angular position [for example, ethyl (**1s**), *n*-propyl (**1t**), and *n*-pentyl (**1u**)] smoothly underwent cyclization–aromatization–rearrangement cascade to furnish the desired BHB-type adducts **2s–u** in good yields (Scheme 3). A tetrasubstituted phenol derivative, **2v**, with a *m*-enone motif was successfully made in 85% yield. Likewise, yne-dienone **1w** with the bulky-phenyl group on the angular position successfully participated in the rearrangement to provide the desired product **2w** in 66% yield. To our disappointment, compound **1x** (having a methoxy group in the angular position of yne-dienone) decomposed during the course of the reaction. Overall, the present demonstration is comparatively productive and effective over the complementary method.[11] In addition, the electron-rich alkyne-containing yne-dienone delivers the best result; this information supports the involvement of a cationic intermediate in this transformation.

To further study the scope and limitations of *α*-aryl-*α*,*β*-unsaturated ketones **2**, the reaction was performed with yne-dienone **1** having substituents at the *α*-position (Scheme 4). In

Scheme 4. Substrate Scope III[a,b]



[a]Reactions were carried out using **1aa–ac** (0.3 mmol), $Cu(OTf)_2$ (10 mol %), in THF (0.1 M; 3 mL) at 95 °C for 12 h. [b]The diasteriomeric ratio was calculated by ^{1}H NMR analysis.

this context, the reaction of a sterically encumbered *ortho*-Me-substituted yne-dienone **1aa** under the optimized conditions delivered the desired product **2aa** in 75% yield as a single *E*-isomer (Scheme 4). Similarly, the yne-dienone **1ab** having *ortho*-OMe on the arene terminus provided **2ab** in 73% yield as an inseparable mixture of diastereomers (*E*/*Z* 76:24). The respective major adduct **2ac** (*E*-isomer) was obtained from **1ac** (Scheme 4). The structure of **2ac** was further confirmed by single-crystal X-ray analysis (Scheme 4).

To expand the synthetic versatility of *α*-aryl-*α*,*β*-unsaturated ketones, common organic transformations were performed on **2a**/**2c** (Scheme 5a). For instance, the BrØnsted acid (TfOH)-mediated intramolecular electrophilic cyclization of enone **2a** delivered 2-arylated-2,3-dihydro-indenone **3** in 63% yield (Scheme 5a).[12] Next, $NaBH_4$-mediated reduction of olefin moiety of **2c** in MeOH led to aryl-alkyl ketone **4** in 68% yield (Scheme 5a).[13] Moreover, thioether **5** (91%) was constructed from the Michael addition of *p*-tolylthiol to **2c** (Scheme 5a).[14] Finally, peroxide-mediated epoxidation of electron-deficient olefin in **2c** furnished the desired product **6** in 98% yield (Scheme 5a).[15] The catalytic system developed for the rearrangement of **1** to **2** was robust; the gram-scale conversion

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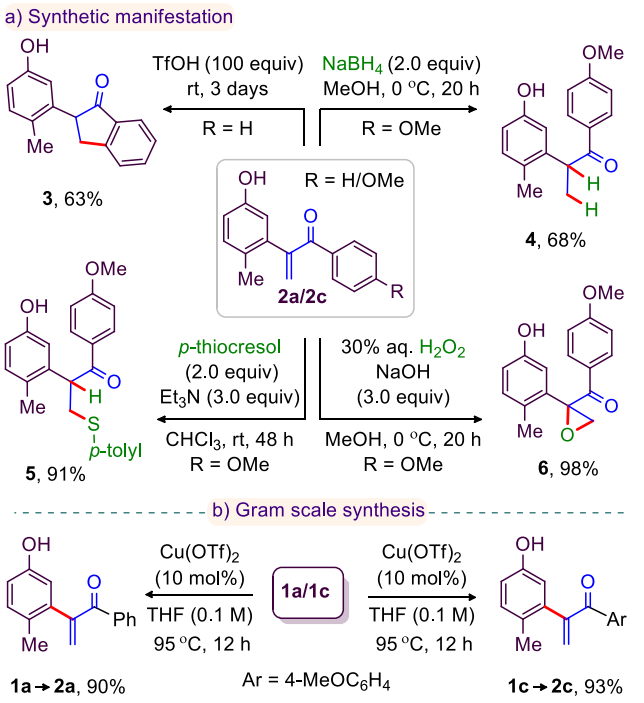
Scheme 5. Applications and Reaction Scalability



of **1a** (1.0 g) → **2a** (0.9 g, 90%) and **1c** (1.0 g) → **2c** (0.93 g, 93%) under standard conditions justified the synthetic potential of the current strategy (Scheme 5b).

To understand the major Van der Waals interactions of α-aryl-α,β-unsaturated ketones, we have carried out Hirshfeld surface analysis[16] and 2D-fingerprint plots of compounds **2b** and **2v**, the images (a, e) in Figure 1; the deep red circles indicate strong intermolecular interactions (O···H/H···O), and other spots are due to H···H and C···H/H···C interactions. The 2D-fingerprint plots (b, f) in Figure 1 denote a pair of spikes at the bottom left, which indicates strong O···H and H···O interactions. The H···H and C···H/H···C interactions are scattered in the middle of the 2D-fingerprint plots. The 2D-fingerprint images (c, g) show H···H (**2b**, 53.8%; **2v**, 56.2%) contacts and contribute to the total Hirshfeld surface. The presence of an additional methyl group in compound **2v** increases H···H interactions by 2.4% than compound **2b**. The individual atomic contact distributions of **2b** and **2v** are shown in images d and h in Figure 1. Hence, these studies disclose the stabilization of crystal lattices **2b** and **2v** by three main interactions: H···H, O···H/H···O, and C···H/H···C.

Based on the experimental facts and the literature reports, the electronic factor controls the reaction dynamics. The plausible mechanism is depicted in Scheme 6. The transformation begins with the activation of enone by $Cu(OTf)_2$ to form the activated complex **VIII**.[17] Next, intramolecular 5-*exo*-trig Michael attack of alkyne to the activated-olefin of **VIII** gives aryl-stabilized vinyl-carbocation intermediate **IX**. The aromatization triggered C−O bond cleavage, and intramolecular charged recombination generates an unstable oxa-cyclobutene intermediate **X**. Finally, electrocyclic 4π-ring-opening of **X** produces the desired product **2** and regenerates the active catalyst for the next cycle.

CONCLUSION

In summary, a Cu-catalyzed α-arylative MSR of yne-dienones for the synthesis of *m*-enone-substituted phenol derivatives has been developed. The labile halo groups, heteroaryl systems, and

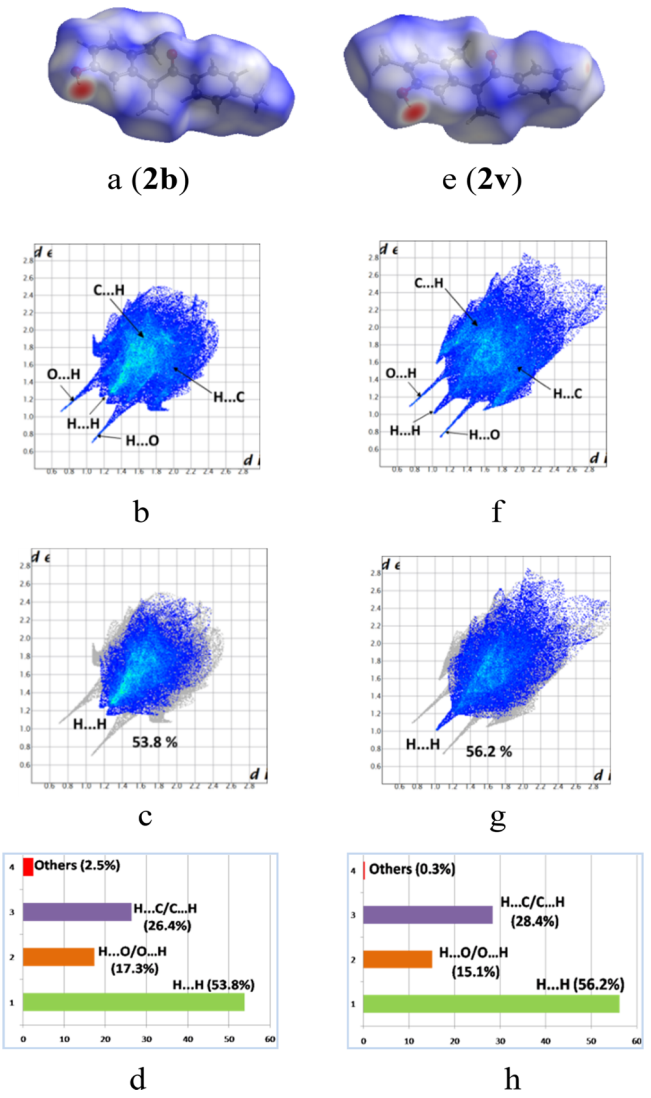
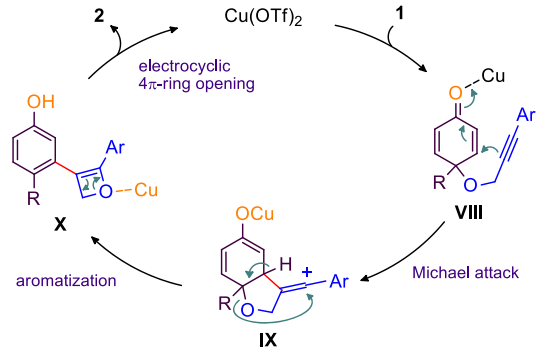


Figure 1. Hirshfeld surface plots for compounds **2b** and **2v** in the crystal structures. Images a and e are the Hirshfeld surface graphs with proximity of close contacts around **2b** and **2v** molecules. Images b and f are 2D-fingerprint plots in crystal packing found in **2b** and **2v**. Images c and g are the H···H atomic contact percentage contribution to the Hirshfeld surface for **2b** and **2v** molecules. Images d and h are the percentage contributions of the individual atomic contacts to the Hirshfeld surface for compounds **2b** and **2v**.

Scheme 6. Plausible Mechanism



the aliphatic chains did not affect the reaction outcome and were well tolerated. The overall process is atom-efficient, providing

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access to a wide range of novel peripheral decorated *m*-phenol derivatives in excellent yields. The transformation is also scalable. Common synthetic transformations of enones make this strategy synthetically useful.

EXPERIMENTAL SECTION

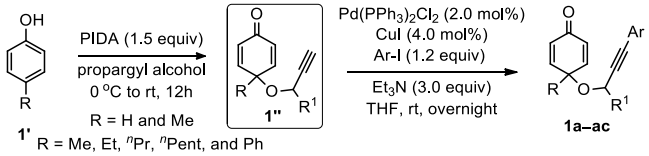
General Information. All reactions were performed in oven-dried reaction vials under a nitrogen atmosphere. Commercial grade solvents were distilled prior to use. Column chromatography was performed using silica gel (100−200 Mesh) with a hexane and ethyl acetate mixture. Thin-layer chromatography (TLC) was performed on silica gel GF 254 plates. Visualization of spots on the TLC plate was accomplished with UV light (254 nm) and staining over an I_2 chamber.

Proton and carbon nuclear magnetic resonance spectra (^{1}H NMR, ^{13}C NMR, and ^{19}F NMR) were recorded on a 400 MHz (^{1}H NMR, 400 MHz; ^{13}C NMR, 101 MHz; ^{19}F NMR, 376 MHz) spectrometer, 500 MHz (^{1}H NMR, 500 MHz; ^{13}C NMR, 126 MHz; ^{19}F NMR, 471 MHz) spectrometer, and a 600 MHz (^{1}H NMR, 600 MHz; ^{13}C NMR, 151 MHz) spectrometer, having solvent resonance as an internal standard (^{1}H NMR, $CHCl_3$ at 7.26 ppm; ^{13}C NMR, $CDCl_3$ at 77.0 ppm). In a few cases, tetramethylsilane (TMS) at 0.00 ppm was used as an reference standard. Data for ^{1}H NMR are reported as follows: chemical shift (ppm), multiplicity (s = singlet; br s = broad singlet; d = doublet; bd = broad doublet, dd= doublet of doublet, dt = doublet of triplet, tt = triplet of triplet, t = triplet; bt = broad triplet; q = quartet; pent = pentet, m = multiplet), coupling constants *J*, in (Hz), and integration.

^{13}C NMR and ^{19}F NMR were reported in terms of chemical shift (ppm). IR spectra were recorded on an FT/IR spectrometer and are reported in cm^{-1}. High-resolution mass spectra (HRMS) were obtained in ESI mode by using a TOF analyzer. Melting points were determined by electrothermal heating and are uncorrected. X-ray data was collected at 298 and 296 K on a Bruker D8 Quest CCD and Bruker D8 VENTURE Photon III detector diffractometer using Mo Kα radiation (0.71073 Å).

Materials. Unless otherwise noted, all reagents and intermediates were obtained commercially and used without purification. Toluene, 1,2-dichloroethane, 1,4-dioxane, chloroform, ethyl acetate, and hexane were distilled over CaH_2. THF was freshly distilled over sodium/benzophenone ketyl under dry nitrogen. $Cu(OTf)_2$, $Sc(OTf)_3$, $Fe(OTf)_3$, $In(OTf)_3$, $Yb(OTf)_3$, triflic acid (TfOH), sodium borohydride ($NaBH_4$), *p*-thiocresol, triethylamine (Et_3N), 30% aq H_2O_2, sodium hydroxide (NaOH) pellets, methanol (CH_3OH), *p*-cresol, propargyl alcohol, iodosobenzene diacetate, CuI, and $PdCl_2(PPh_3)_2$ were commercially available and used as received. Aryl iodides were purchased and used as such. Following the known procedure,[8c,9,18,19] compounds **1a**−**ac** were synthesized. Analytical and spectral data of all those known compounds exactly match the reported values.

General Method for the Preparation of Starting Materials.



General Procedure for the Synthesis of 1″ (GP-1). To a stirred solution of 4-substituted phenol **1′** (10 mmol) in 10 mL of propargyl alcohol was added phenyliodo(III)diacetate (15 mmol) in several portions at 0 °C. The resulting reaction mixture was warmed to room temperature and stirred overnight. Then the reaction was quenched with saturated aqueous sodium bicarbonate (30 mL) and extracted with ethyl acetate (3 × 20 mL). The combined organic layer was washed with brine (20 mL), dried over Na_2SO_4, filtered, and concentrated in vacuo. The crude reaction mixture was purified by silica gel (100−200 mesh) column chromatography (EtOAc/hexane) to give the respective terminal cyclohexadienones **1″**.

General Procedure for the Synthesis of Alkynyl Cyclohexadienone 1a−ac (GP-2):.[8c,9,18,19] To a solution of **1″** (1.0 mmol), $Pd(PPh_3)_2Cl_2$ (2.0 mol %, 14 mg), and CuI (4.0 mol %, 7.6 mg) in THF (2.0 mL) was added aryliodide (1.2 mmol) under a nitrogen atmosphere. Finally, triethylamine (3.0 mmol, 0.42 mL) was added to the above mixture, and the resulting mixture was stirred at room temperature overnight. After completion, the reaction mixture was filtered, concentrated in vacuo, and purified by silica gel (100−200 mesh) column chromatography to give the desired alkynyl cyclohexadienones **1a**−**ac**. The analytical and spectral data for compounds **1a**−**c**, **1e**−**h**, **1j**−**k**, **1m**, **1n**, **1p**, **1r**−**t**, **1v**, and **1w** exactly match the reported values.

4-((3-(4-(tert-Butyl)phenyl)prop-2-yn-1-yl)oxy)-4-methylcyclohexa-2,5-dienone (1d). Compound **1d** (153 mg) was obtained in 52% yield: brown solid; mp = 93−95 °C; R_f = 0.40 (9:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.36−7.30 (m, 4H), 6.89 (dt, *J* = 10, 3.0 Hz, 2H), 6.32 (dt, *J* = 10, 3.5 Hz, 2H), 4.22 (s, 2H), 1.49 (s, 3H), 1.29 (s, 9H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 185.0, 151.8, 151.0, 131.4, 130.3, 125.2, 119.3, 87.0, 85.1, 73.2, 54.6, 34.7, 31.1, 26.4; IR (neat) ν_{max} 2964, 1661, 1604, 1512, 1452, 1369, 1274, 1194 cm^{-1}; HRMS (ESI) *m*/*z* [M + H]$^+$ calcd for $C_{20}H_{23}O_2^+$ 295.1693, found 295.1703.

4-((3-(4-Iodophenyl)prop-2-yn-1-yl)oxy)-4-methylcyclohexa-2,5-dienone (1i). Compound **1i** (149 mg) was obtained in 41% yield: colorless solid; mp = 117−119 °C; R_f = 0.31 (9:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (dt, *J* = 8.5, 2.0 Hz, 2H), 7.12 (dt, *J* = 8.5, 2.0 Hz, 2H), 6.86 (dt, *J* = 10.5, 3.0 Hz, 2H), 6.32 (dt, *J* = 10, 3.5 Hz, 2H), 4.19 (s, 2H), 1.49 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 184.9, 150.7, 137.5, 133.1, 130.4, 121.8, 94.6, 87.1, 85.8, 73.2, 54.4, 26.3; IR (neat) ν_{max} 2986, 2230, 1657, 1627, 1477, 1452, 1452, 1385, 1299, 1264, 1188 cm^{-1}; HRMS (ESI) *m*/*z* [M + H]$^+$ calcd for $C_{16}H_{14}IO_2^+$ 365.0033, found 365.0038.

4-((3-(3-Chlorophenyl)prop-2-yn-1-yl)oxy)-4-methylcyclohexa-2,5-dienone (1l). Compound **1l** (196 mg) was obtained in 72% yield: brown solid; mp = 76−78 °C; R_f = 0.35 (9:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 (s, 1H), 7.30−7.27 (m, 2H), 7.23 (d, *J* = 8.0 Hz, 1H), 6.86 (dt, *J* = 10.5, 3.0 Hz, 2H), 6.32 (dt, *J* = 10, 3.5 Hz, 2H), 4.20 (s, 2H), 1.49 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 184.9, 150.7, 134.1, 131.5, 130.4, 129.8, 129.5, 128.9, 124.0, 87.0, 85.3, 73.2, 54.3, 26.3; IR (neat) ν_{max} 2983, 1661, 1621, 1595, 1484, 1398, 1372, 1299, 1198 cm^{-1}; HRMS (ESI) *m*/*z* [M + H]$^+$ calcd for $C_{16}H_{14}ClO_2^+$ 273.0677, found 273.0683.

4-((3-(2-Methoxyphenyl)prop-2-yn-1-yl)oxy)-4-methylcyclohexa-2,5-dienone (1o). Compound **1o** (169 mg) was obtained in 63% yield: colorless solid; mp = 124−126 °C; R_f = 0.20 (9:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.37 (dd, *J* = 7.5, 2.0 Hz, 1H), 7.31−7.27 (m, 1H), 6.94−6.88 (m, 3H), 6.86 (d, *J* = 8.5 Hz, 1H), 6.32 (dt, *J* = 10, 3.0 Hz, 2H), 4.28 (s, 2H), 3.86 (s, 3H), 1.50 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 185.1, 160.2, 151.2, 133.7, 130.3, 130.0, 120.4, 111.6, 110.6, 90.0, 83.3, 73.3, 55.7, 54.8, 26.4; IR (neat) ν_{max} 2919, 2227, 1668, 1624, 1595, 1499, 1452, 1267, 1245, 1185 cm^{-1}; HRMS (ESI) *m*/*z* [M + H]$^+$ calcd for $C_{17}H_{17}O_3^+$ 269.1172, found 269.1179.

4-((3-(3,4-Dimethylphenyl)prop-2-yn-1-yl)oxy)-4-methylcyclohexa-2,5-dienone (1q). Compound **1q** (120 mg) was obtained in 45% yield: gray solid; mp = 142−144 °C; R_f = 0.38 (9:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.19 (s, 1H), 7.15 (d, *J* = 8.0 Hz, 1H), 7.05 (d, *J* = 8.0 Hz, 1H), 6.89 (dt, *J* = 10, 3.5 Hz, 2H), 6.32 (dt, *J* = 10, 3.0 Hz, 2H), 4.21 (s, 2H), 2.24 (s, 3H), 2.21 (s, 3H), 1.49 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 185.1, 151.1, 137.5, 136.6, 132.7, 130.3, 129.5, 129.1, 119.6, 87.1, 84.8, 73.1, 54.6, 26.4, 19.7, 19.5; IR (neat) ν_{max} 2932, 2224, 1662, 1627, 1493, 1449, 1372, 1309, 1245, 1182 cm^{-1}; HRMS (ESI) *m*/*z* [M + H]$^+$ calcd for $C_{18}H_{19}O_2^+$ 267.1380, found 267.1389.

4-Pentyl-4-((3-phenylprop-2-yn-1-yl)oxy)cyclohexa-2,5-dienone (1u). Compound **1u** (218 mg) was obtained in 74% yield: colorless solid; mp = 64−66 °C; R_f = 0.53 (9:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42−7.39 (m, 2H), 7.32−7.28 (m, 3H), 6.85 (dt, *J* = 10, 3.0 Hz, 2H), 6.37 (dt, *J* = 10.5, 3.0 Hz, 2H), 4.23 (s, 2H), 1.82−1.77 (m, 2H), 1.29−1.22 (m, 6H), 0.85 (t, *J* = 6.5 Hz, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 185.4, 150.4, 131.6, 131.3, 128.5, 128.2, 122.4, 86.7, 85.9, 76.4, 54.3, 39.3, 31.8, 23.1, 22.3, 13.9; IR (neat) ν_{max} 2964, 2932, 1662, 1621, 1496, 1449, 1374, 1334, 1264, 1182

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cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{20}H_{23}O_2^+$ 295.1693, found 295.1704.

General Procedure for the Synthesis of α-Aryl-α,β-unsaturated Ketones ***2***. A mixture of alkynyl-cyclohexadienone **1** (0.3 mmol) and $Cu(OTf)_2$ (11 mg, 0.03 mmol) in THF (3.0 mL) was taken in a screw-cap sealed tube. The reaction mixture was heated to 95 °C and stirred overnight. The reaction progress was monitored by thin-layer chromatography (TLC) analysis. Upon completion, the reaction mixture was cooled to room temperature and diluted with dichloromethane (3.0 mL). The crude residue was purified using column chromatography on silica gel (100−200 mesh) to provide desired α-aryl-α,β-unsaturated ketones **2**.

2-(5-Hydroxy-2-methylphenyl)-1-phenylprop-2-en-1-one ***(2a)***. Following the general procedure, compound **2a** (68 mg) was obtained in 95% yield: yellow gummy liquid; R_f = 0.54 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.88 (d, J = 7.8 Hz, 2H), 7.56 (t, J = 7.2 Hz, 1H), 7.45 (t, J = 7.2 Hz, 2H), 7.00 (d, J = 7.2 Hz, 1H), 6.76 (d, J = 2.4 Hz, 1H), 6.72 (dd, J = 7.8, 3.0 Hz, 1H), 6.00 (s, 1H), 5.97 (s, 1H), 5.09 (s, 1H), 2.12 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 197.3, 154.1, 148.8, 138.8, 136.9, 132.8, 131.2, 129.8, 128.4, 128.3, 127.0, 116.8, 115.5, 19.4; IR (neat) ν_{max} 3368, 3058, 2922, 1649, 1596, 1576, 1495, 1446, 1281, 1253, 1228 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{15}O_2^+$ 239.1067, found 239.1073.

2-(5-Hydroxy-2-methylphenyl)-1-(p-tolyl)prop-2-en-1-one ***(2b)***. Following the general procedure, compound **2b** (73 mg) was obtained in 96% yield: colorless solid; mp = 148−151 °C; R_f = 0.46 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (dd, J = 8.4, 1.6 Hz, 2H), 7.23 (d, J = 8.0 Hz, 2H), 6.95 (d, J = 8.0 Hz, 1H), 6.74 (bd, J = 2.4 Hz, 1H), 6.68 (dd, J = 8.4, 2.8 Hz, 1H), 6.40 (bs, 1H), 5.94 (s, 1H), 5.92 (s, 1H), 2.41 (s, 3H), 2.09 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 197.1, 154.1, 148.9, 143.8, 139.0, 134.2, 131.2, 130.1, 129.0, 127.7, 127.0, 116.9, 115.5, 21.6, 19.5; IR (neat) ν_{max} 3331, 3031, 2920, 1631, 1597, 1563, 1498, 1437, 1408, 1286, 1218 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{17}O_2^+$ 253.1223, found 253.1228.

2-(5-Hydroxy-2-methylphenyl)-1-(4-methoxyphenyl)prop-2-en-1-one ***(2c)***. Following the general procedure, compound **2c** (76 mg) was obtained in 94% yield: colorless solid; mp = 178−180 °C; R_f = 0.35 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, DMSO-d_6) δ 9.29 (s, 1H), 7.84 (d, J = 8.5 Hz, 2H), 7.04 (d, J = 9.0 Hz, 2H), 6.95 (d, J = 8.0 Hz, 1H), 6.69−6.64 (m, 2H), 5.91 (s, 1H), 5.79 (s, 1H), 3.83 (s, 3H), 1.99 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, DMSO-d_6) δ 194.9, 163.5, 155.8, 149.1, 139.6, 132.2, 131.5, 129.6, 126.2, 125.4, 116.7, 115.5, 114.3, 56.0, 19.5; IR (neat) ν_{max} 3282, 3022, 2918, 1624, 1591, 1563, 1313, 1291, 1255, 1217 cm^{-1}; HRMS (ESI) m/z $[M + Na]^+$ calcd for $C_{17}H_{16}NaO_3^+$ 291.0992, found 291.0998.

1-(4-(tert-Butyl)phenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one ***(2d)***. Following the general procedure, compound **2d** (86 mg) was obtained in 97% yield: pale yellow solid; mp = 127−130 °C; R_f = 0.64 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (dt, J = 8.4, 2.0 Hz, 2H), 7.46 (dt, J = 8.8, 2.0 Hz, 2H), 6.98 (d, J = 8.4 Hz, 1H), 6.75 (d, J = 2.8 Hz, 1H), 6.70 (dd, J = 8.0, 2.8 Hz, 1H), 5.95 (dd, J = 14, 1.2 Hz, 2H), 5.85 (bs, 1H), 2.11 (s, 3H), 1.34 (s, 9H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.7, 156.6, 154.0, 149.0, 139.2, 134.3, 131.2, 129.9, 127.5, 127.3, 125.3, 116.9, 115.4, 35.1, 31.1, 19.5; IR (neat) ν_{max} 3382, 3055, 1602, 1497, 1461, 1375, 1264 cm^{-1}; HRMS (ESI) m/z $[M + Na]^+$ calcd for $C_{20}H_{22}NaO_2^+$ 317.1512, found 317.1517.

1-(4-Acetylphenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one ***(2e)***. Following the general procedure, compound **2e** (52 mg) was obtained in 62% yield: yellow solid; mp = 193−196 °C; R_f = 0.21 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, DMSO−D_6) δ 9.05 (s, 1H), 8.00 (s, 1H), 7.99 (d, J = 3.6 Hz, 1H), 7.87 (d, J = 8.4 Hz, 2H), 6.91 (d, J = 8.8 Hz, 1H), 6.70−6.63 (m, 2H), 6.01 (s, 1H), 5.91 (s, 1H), 2.60 (s, 3H), 2.01 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$ + DMSO-d_6) δ 195.4, 193.7, 153.9, 147.0, 138.9, 137.9, 136.8, 129.3, 127.9, 126.9, 126.5, 123.6, 114.9, 113.8, 25.3, 17.6; IR (neat) ν_{max} 3310, 2919, 1683, 1637, 1604, 1560, 1494, 1451, 1354, 1286, 1253 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{18}H_{17}O_3^+$ 281.1172, found 281.1179.

1-(4-Fluorophenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one ***(2f)***. Following the general procedure, compound **2f** (62 mg) was obtained in 80% yield: colorless liquid; R_f = 0.64 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$): δ 7.95−7.89 (m, 2H), 7.13−7.07 (m, 2H), 6.96 (d, J = 8.0 Hz, 1H), 6.73 (d, J = 2.5 Hz, 1H), 6.69 (dd, J = 8.0, 2.5 Hz, 1H), 6.33 (s, 1H), 5.96 (d, J = 0.5 Hz, 1H), 5.93 (d, J = 0.5 Hz, 1H), 2.07 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 195.7, 165.6 (d, J = 256 Hz, 1C), 154.1, 148.7, 138.7, 133.1 (d, J = 2.5 Hz, 1C), 132.5 (d, J = 10 Hz, 1C), 131.3, 128.0, 127.1, 116.8, 115.6, 115.4, 19.4; ^{19}F NMR (471 MHz, $CDCl_3$) δ − 104.9; IR (neat) ν_{max} 3368, 2923, 1643, 1596, 1502, 1282, 1228, 1154 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}FO_2^+$ 257.0972, found 257.0977.

1-(4-Chlorophenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one ***(2g)***. Following the general procedure, compound **2g** (61 mg) was obtained in 75% yield: pale yellow solid; mp = 131−134 °C; R_f = 0.50 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (dd, J = 8.4, 1.6 Hz, 2H), 7.39 (dd, J = 8.4, 1.6 Hz, 2H), 6.96 (d, J = 8.0 Hz, 1H), 6.73 (d, J = 2.8 Hz, 1H), 6.68 (dd, J = 8.4, 2.4 Hz, 1H), 6.33 (bs, 1H), 5.97 (s, 1H), 5.94 (s, 1H), 2.07 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 195.9, 154.0, 148.6, 139.3, 138.6, 135.1, 131.3, 131.2, 128.7, 128.4, 127.1, 116.7, 115.6, 19.4; IR (neat) ν_{max} 3361, 2922, 1630, 1602, 1583, 1562, 1498, 1432, 1400, 1346, 1284, 1207 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}ClO_2^+$ 273.0677, found 273.0683.

1-(4-Bromophenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one ***(2h)***. Following the general procedure, compound **2h** (55 mg) was obtained in 58% yield: yellow solid; mp = 157−160 °C; R_f = 0.50 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, J = 8.8 Hz, 2H), 7.57 (d, J = 8.8 Hz, 2H), 6.97 (d, J = 8.0 Hz, 1H), 6.73 (bd, J = 2.8 Hz, 1H), 6.69 (dd, J = 8.0, 2.8 Hz, 1H), 5.98 (d, J = 0.8 Hz, 1H), 5.95 (d, J = 0.8 Hz, 1H), 2.07 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 195.9, 154.0, 148.6, 138.7, 135.6, 131.7, 131.4, 131.3, 128.4, 128.0, 127.2, 116.7, 115.6, 19.4; IR (neat) ν_{max} 3359, 2922, 1628, 1603, 1580, 1497, 1451, 1398, 1283, 1254 cm^{-1}; HRMS (ESI) m/z $[M + Na]^+$ calcd for $C_{16}H_{13}BrNaO_2^+$ 338.9991, found 339.0008.

2-(5-Hydroxy-2-methylphenyl)-1-(4-iodophenyl)prop-2-en-1-one ***(2i)***. Following the general procedure, compound **2i** (67 mg) was obtained in 61% yield: colorless solid; mp = 158−160 °C; R_f = 0.58 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.33 (s, 1H), 7.91 (d, J = 8.4 Hz, 2H), 7.58 (d, J = 8.4 Hz, 2H), 6.96 (d, J = 8.0 Hz, 1H), 6.68 (bd, J = 2.4 Hz, 1H), 6.65 (s, 1H), 6.03 (s, 1H), 5.88 (s, 1H), 1.97 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 195.9, 155.9, 148.5, 139.2, 138.1, 136.6, 131.6, 131.5, 128.7, 125.5, 116.9, 115.7, 102.0, 19.6; IR (neat) ν_{max} 3357, 1627, 1575, 1496, 1432, 1390, 1344, 1283 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}IO_2^+$ 365.0033, found 365.0042.

2-(5-Hydroxy-2-methylphenyl)-1-(m-tolyl)prop-2-en-1-one ***(2j)***. Following the general procedure, compound **2j** (59 mg) was obtained in 78% yield: pale yellow solid; mp = 152−154 °C; R_f = 0.57 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.72 (s, 1H), 7.67 (d, J = 7.6 Hz, 1H), 7.37 (d, J = 7.6 Hz, 1H), 7.32 (t, J = 7.6 Hz, 1H), 6.96 (d, J = 8.4 Hz, 1H), 6.74 (d, J = 2.8 Hz, 1H), 6.69 (dd, J = 8.4, 2.8 Hz, 1H), 6.61 (bs, 1H), 5.98 (bd, J = 1.2 Hz, 1H), 5.93 (bd, J = 1.2 Hz, 1H), 2.39 (s, 3H), 2.10 (s, 3H); ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 197.5, 154.1, 148.9, 138.8, 138.2, 137.0, 133.6, 131.1, 130.2, 128.3, 128.1, 127.2, 127.0, 116.9, 115.5, 21.3, 19.4; IR (neat) ν_{max} 3383, 1654, 1602, 1581, 1496, 1358, 1264 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{17}O_2^+$ 253.1223, found 253.1232.

1-(3-Fluorophenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one ***(2k)***. Following the general procedure, compound **2k** (42 mg) was obtained in 54% yield: pale yellow solid; mp = 120−122 °C; R_f = 0.53 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 (d, J = 8.0 Hz, 1H), 7.59−7.54 (m. 1H), 7.44−7.39 (m, 1H), 7.28−7.23 (m, 1H), 6.99 (d, J = 8.0 Hz, 1H), 6.74−6.69 (m, 2H), 6.02 (s, 1H), 5.98 (s, 1H), 5.74 (bs, 1H), 2.09 (s, 3H); ^{13}C{^{1}H} NMR (126 MHz, $CDCl_3$) δ 195.3, 162.5 (d, J = 250 Hz, 1C), 153.9, 148.5, 139.1 (d, J = 6.3 Hz, 1C), 138.7, 131.4, 130.0 (d, J = 7.6 Hz, 1C), 128.6, 127.3, 125.5 (d, J = 2.5 Hz, 1C), 119.8 (d, J = 21 Hz, 1C), 116.7, 116.5 (d, J = 22 Hz, 1C), 115.6, 19.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ − 111.7; IR

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(neat) ν_{max} 3371, 3056, 1656, 1585, 1497, 1440, 1264 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}FO_2^+$ 257.0972, found 257.0977.

*1-(3-Chlorophenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one (**2l**).* Following the general procedure, compound **2l** (53 mg) was obtained in 65% yield: colorless solid; mp = 134−136 °C; R_f = 0.48 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.86 (bt, J = 1.5 Hz, 1H), 7.73 (d, J = 7.5 Hz, 1H), 7.54−7.50 (m, 1H), 7.37 (t, J = 8.0 Hz, 1H), 6.97 (d, J = 8.5 Hz, 1H), 6.72 (d, J = 3.0 Hz, 1H), 6.69 (dd, J = 8.0, 2.5 Hz, 1H), 6.40 (bs, 1H), 6.02 (s, 1H), 5.96 (s, 1H), 2.08 (s, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 195.6, 154.0, 148.5, 138.6, 138.4, 134.6, 132.7, 131.3, 129.64, 129.59, 128.9, 127.9, 127.1, 116.8, 115.7, 19.4; IR (neat) ν_{max} 3383, 3064, 1661, 1569, 1497, 1419, 1235 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}ClO_2^+$ 273.0677, found 273.0682.

*2-(5-Hydroxy-2-methylphenyl)-1-(3-iodophenyl)prop-2-en-1-one (**2m**).* Following the general procedure, compound **2m** (68 mg) was obtained in 62% yield: colorless semisolid; mp = 125−127 °C; R_f = 0.49 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (400 MHz, $CDCl_3$) δ 8.01−7.97 (m, 1H), 7.68 (dd, J = 8.0, 0.8 Hz, 1H), 7.60 (dd, J = 8.0, 1.2 Hz, 1H), 7.00 (t, J = 7.6 Hz, 1H), 6.81−6.75 (m, 1H), 6.60−6.54 (m, 2H), 5.82 (s, 1H), 5.76 (s, 1H), 1.88 (s, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$ + DMSO-d_6) δ 194.3, 154.9, 148.2, 140.8, 138.6, 138.0, 137.7, 130.7, 129.6, 128.4, 127.9, 125.4, 116.2, 115.2, 93.6, 19.0; IR (neat) ν_{max} 3360, 1656, 1579, 1495, 1457, 1410, 1229 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}IO_2^+$ 365.0033, found 365.0040. The −OH proton is not detected by ^1H NMR.

*2-(5-Hydroxy-2-methylphenyl)-1-(o-tolyl)prop-2-en-1-one (**2n**).* Following the general procedure, compound **2n** (57 mg) was obtained in 75% yield: pale yellow solid; mp = 156−158 °C; R_f = 0.60 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (400 MHz, $CDCl_3$) δ 7.45 (dd, J = 7.6, 1.2 Hz, 1H), 7.39−7.34 (m, 1H), 7.29−7.20 (m, 2H), 7.05 (d, J = 8.4 Hz, 1H), 6.72 (dd, J = 8.4, 2.8 Hz, 1H), 6.68 (d, J = 2.4 Hz, 1H), 6.09 (bd, J = 0.8 Hz, 1H), 5.97 (bd, J = 1.2 Hz, 1H), 5.28 (bs, 1H), 2.43 (s, 3H), 2.17 (s, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 198.6, 153.6, 150.1, 138.3, 138.1, 137.2, 131.9, 131.2, 131.1, 130.4, 128.6, 127.9, 125.0, 116.8, 115.2, 20.0, 19.3; IR (neat) ν_{max} 3385, 3055, 1659, 1497, 1320, 1264 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{17}O_2^+$ 253.1223, found 253.1229.

*2-(5-Hydroxy-2-methylphenyl)-1-(2-methoxyphenyl)prop-2-en-1-one (**2o**).* Following the general procedure, compound **2o** (80 mg) was obtained in 99% yield: yellow liquid; R_f = 0.36 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.44−7.39 (m, 2H), 7.00 (d, J = 7.5 Hz, 2H), 6.92 (d, J = 8.5 Hz, 1H), 6.68 (dd, J = 8.0, 3.0 Hz, 1H), 6.66 (d, J = 3.0 Hz, 1H), 5.98 (d, J = 1.0 Hz, 1H), 5.96 (d, J = 1.0 Hz, 1H), 5.83 (bs, 1H), 3.78 (s, 3H), 2.16 (s, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 197.2, 157.3, 153.6, 150.1, 138.2, 132.0, 130.9, 130.4, 129.7, 128.7, 127.8, 120.3, 116.9, 115.1, 111.4, 55.4, 19.2; IR (neat) ν_{max} 3379, 2924, 1651, 1597, 1487, 1460, 1285, 1248 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{17}O_3^+$ 269.1172, found 269.1179.

*1-(2-Chlorophenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one (**2p**).* Following the general procedure, compound **2p** (36 mg) was obtained in 44% yield: yellow semisolid; R_f = 0.50 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.45−7.42 (m, 1H), 7.41−7.38 (m, 2H), 7.35−7.31 (m, 1H), 7.06 (d, J = 8.5 Hz, 1H), 6.72 (dd, J = 8.0, 2.5 Hz, 1H), 6.67 (d, J = 2.5 Hz, 1H), 6.16 (d, J = 0.5 Hz, 1H), 6.02 (d, J = 0.5 Hz, 1H), 5.50 (bs, 1H), 2.20 (s, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 195.5, 153.5, 149.0, 138.4, 137.3, 133.7, 131.2, 131.1, 131.0, 130.1, 129.0, 128.1, 126.5, 116.8, 115.4, 19.2; IR (neat) ν_{max} 3349, 3056, 2922, 1641, 1604, 1587, 1496, 1346, 1286, 1205 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{14}ClO_2^+$ 273.0677, found 273.0686.

*1-(3,4-Dimethylphenyl)-2-(5-hydroxy-2-methylphenyl)prop-2-en-1-one (**2q**).* Following the general procedure, compound **2q** (73 mg) was obtained in 91% yield: pale yellow solid; mp = 150−152 °C; R_f = 0.44 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (400 MHz, $CDCl_3$) δ 7.71 (s, 1H), 7.64 (dd, J = 7.6, 1.6 Hz, 1H), 7.19 (d, J = 8.0 Hz, 1H), 6.95 (d, J = 8.0 Hz, 1H), 6.72 (d, J = 2.4 Hz, 1H), 6.67 (dd, J = 8.4, 2.8 Hz, 1H), 6.33 (bs, 1H), 5.95 (bd, J = 1.2 Hz, 1H), 5.90 (bd, J = 1.2 Hz, 1H), 2.32 (s, 3H), 2.30 (s, 3H), 2.09 (s, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 197.3, 154.1, 149.0, 142.6, 139.0, 136.8, 134.6, 131.2, 131.0, 129.5, 127.9, 127.6, 127.0, 116.9, 115.5, 20.0, 19.7, 19.5; IR (neat) ν_{max} 3337, 2921, 2854, 1626, 1600, 1563, 1498, 1437, 1356, 1291, 1224 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{18}H_{19}O_2^+$ 267.1380, found 267.1385.

*2-(5-Hydroxy-2-methylphenyl)-1-(thiophen-2-yl)prop-2-en-1-one (**2r**).* Following the general procedure, compound **2r** (72 mg) was obtained in 98% yield: yellow liquid; R_f = 0.55 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.63 (dd, J = 5.0, 1.0 Hz, 1H), 7.53 (dd, J = 4.0, 1.0 Hz, 1H), 7.05−7.02 (m, 1H), 6.96 (d, J = 8.0 Hz, 1H), 6.79 (d, J = 3.0 Hz, 1H), 6.74 (dd, J = 8.5, 2.5 Hz, 1H), 6.13 (bd, J = 1.0 Hz, 1H), 5.81 (bd, J = 1.0 Hz, 1H), 2.07 (s, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 188.2, 154.2, 148.7, 143.1, 138.7, 134.8, 134.6, 131.3, 128.1, 127.4, 126.5, 116.9, 115.8, 19.4; IR (neat) ν_{max} 3365, 2920, 1605, 1577, 1495, 1407, 1353, 1233, 1052 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{14}H_{13}O_2S^+$ calcd 245.0631, found 245.0637. The −OH proton is not detected by ^1H NMR.

*2-(2-Ethyl-5-hydroxyphenyl)-1-phenylprop-2-en-1-one (**2s**).* Following the general procedure, compound **2s** (58 mg) was obtained in 76% yield: yellow liquid; R_f = 0.64 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.89 (dd, J = 8.0, 1.0 Hz, 2H), 7.59−7.54 (m, 1H), 7.45 (t, J = 8.0 Hz, 2H), 7.02 (d, J = 8.0 Hz, 1H), 6.74 (dd, J = 8.5, 3.0 Hz, 1H), 6.72 (d, J = 2.5 Hz, 1H), 6.31 (bs, 1H), 6.00 (bd, J = 0.5 Hz, 1H), 5.95 (bd, J = 1.0 Hz, 1H), 2.43 (q, J = 7.5 Hz, 2H), 1.09 (t, J = 7.5 Hz, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 197.3, 153.9, 148.7, 138.4, 137.0, 133.3, 132.8, 129.8, 129.4, 128.8, 128.3, 117.1, 115.8, 25.8, 15.3; IR (neat) ν_{max} 3367, 2964, 2871, 1648, 1597, 1576, 1495, 1446, 1260, 1226 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{17}O_2^+$ 253.1223, found 253.1233.

*2-(5-Hydroxy-2-propylphenyl)-1-phenylprop-2-en-1-one (**2t**).* Following general the procedure, compound **2t** (64 mg) was obtained in 80% yield: pale yellow solid; mp = 116−118 °C; R_f = 0.56 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (400 MHz, $CDCl_3$) δ 7.90 (dd, J = 7.6, 0.4 Hz, 2H), 7.60−7.55 (m, 1H), 7.45 (t, J = 8.0 Hz, 2H), 7.02−6.97 (m, 1H), 6.75−6.70 (m, 2H), 6.48 (bs, 1H), 5.99 (bd, J = 1.2 Hz, 1H), 5.94 (bd, J = 0.8 Hz, 1H), 2.36 (t, J = 7.6 Hz, 2H), 1.55−1.45 (m, 2H), 0.83 (t, J = 7.2 Hz, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 197.4, 153.9, 148.8, 138.6, 136.9, 132.8, 131.8, 130.2, 129.8, 128.8, 128.3, 117.3, 115.6, 35.1, 24.4, 13.9; IR (neat) ν_{max} 3367, 2956, 2867, 1629, 1595, 1493, 1441, 1345, 1318, 1253 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{18}H_{19}O_2^+$ 267.1380, found 267.1386.

*2-(5-Hydroxy-2-pentylphenyl)-1-phenylprop-2-en-1-one (**2u**).* Following the general procedure, compound **2u** (45 mg) was obtained in 51% yield: colorless gummy liquid; R_f = 0.70 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.90 (dd, J = 8.0, 1.0 Hz, 2H), 7.59−7.55 (m, 1H), 7.45 (t, J = 8.0 Hz, 2H), 7.00 (dd, J = 7.0, 1.5 Hz, 1H), 6.75−6.71 (m, 2H), 6.12 (bs, 1H), 5.99 (bd, J = 1.5 Hz, 1H), 5.95 (bd, J = 1.5 Hz, 1H), 2.37 (t, J = 8.0 Hz, 2H), 1.50−1.43 (m, 2H), 1.27−1.15 (m, 4H), 0.82 (t, J = 7.0 Hz, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 197.2, 153.8, 148.8, 138.6, 137.0, 132.8, 132.2, 130.2, 129.9, 128.7, 128.3, 117.2, 115.6, 33.0, 31.6, 30.9, 22.4, 14.0; IR (neat) ν_{max} 3381, 2954, 2926, 2857, 1648, 1597, 1576, 1494, 1445, 1260, 1228 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{20}H_{23}O_2^+$ 295.1693, found 295.1695.

*2-(5-Hydroxy-2,4-dimethylphenyl)-1-phenylprop-2-en-1-one (**2v**).* Following the general procedure, compound **2v** (64 mg) was obtained in 85% yield: pale yellow solid; mp = 102−105 °C; R_f = 0.60 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (600 MHz, $CDCl_3$) δ 7.89 (dd, J = 8.4, 1.2 Hz, 2H), 7.57−7.53 (m, 1H), 7.44 (t, J = 7.8 Hz, 2H), 6.89 (s, 1H), 6.66 (s, 1H), 5.96 (bd, J = 1.2 Hz, 1H), 5.91 (bd, J = 1.2 Hz, 1H), 5.58 (bs, 1H), 2.18 (s, 3H), 2.09 (s, 3H); $^{13}C\{^1H\}$ NMR (151 MHz, $CDCl_3$) δ 197.2, 152.1, 148.8, 137.1, 136.3, 132.8, 132.7, 129.9, 128.3, 127.8, 127.1, 124.3, 116.4, 19.4, 15.5; IR (neat) ν_{max} 3372, 1630, 1592, 1507, 1445, 1412, 1348, 1324, 1270 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{17}O_2^+$ 253.1223, found 253.1240.

*2-(4-Hydroxy-[1,1′-biphenyl]-2-yl)-1-phenylprop-2-en-1-one (**2w**).* Following the general procedure, compound **2w** (60 mg) was obtained in 66% yield: colorless solid; mp = 205−207 °C; R_f = 0.41 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (600 MHz, $CDCl_3$) δ 7.46−7.40 (m, 3H), 7.28−7.23 (m, 2H), 7.19 (t, J = 7.2 Hz, 2H), 7.16−

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7.09 (m, 4H), 6.92 (d, J = 3.0 Hz, 1H), 6.84 (dd, J = 9.0, 3.0 Hz, 1H), 6.25 (bs, 1H), 6.08 (s, 1H), 5.91 (s, 1H); $^{13}C\{^1H\}$ NMR (151 MHz, $CDCl_3$) δ 196.6, 155.4, 149.1, 140.7, 138.5, 136.7, 133.6, 132.3, 131.2, 129.9, 129.6, 128.8, 128.0, 127.7, 126.7, 117.5, 115.8; IR (neat) ν_{max} 3324, 1978, 1640, 1597, 1447, 1271, 1200, 980 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{21}H_{17}O_2$+ 301.1223, found 301.1230.

*2-(5-Hydroxy-2-methylphenyl)-1-(o-tolyl)but-2-en-1-one (**2aa**).* Following the general procedure, compound **2aa** (60 mg) was obtained in 75% yield: pale yellow liquid; R_f = 0.39 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (600 MHz, $CDCl_3$) δ 7.36−7.28 (m, 2H), 7.25−7.19 (m, 2H), 7.12 (d, J = 7.8 Hz, 1H), 6.72 (dd, J = 7.8, 2.4 Hz, 1H), 6.65 (q, J = 6.6 Hz, 1H), 6.55 (d, J = = 2.4 Hz, 1H), 5.04 (bs, 1H), 2.36 (s, 3H), 2.12 (s, 3H), 1.68 (d, J = 7.2 Hz, 3H); $^{13}C\{^1H\}$ NMR (151 MHz, $CDCl_3$) δ 199.0, 153.5, 146.7, 144.5, 139.6, 135.8, 135.7, 131.1, 130.7, 129.5, 128.4, 127.5, 125.1, 116.6, 115.0, 19.63, 18.74, 16.02; IR (neat) ν_{max} 3317, 2943, 2831, 1449, 1416, 1264, 1021 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{18}H_{19}O_2^+$ 267.1380, found 267.1394.

*2-(5-Hydroxy-2-methylphenyl)-1-(o-tolyl)but-2-en-1-one (**2ab**).* Following the general procedure, compound **2ab** (62 mg) was obtained in 73% overall yield (inseparable mixture of diasteriomers): colorless solid; mp = 158−160 °C; R_f = 0.33 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (600 MHz, $CDCl_3$) δ 7.99 (dd, J = 7.2, 1.8 Hz, 0.77H), 7.80 (dd, J = 6.6, 1.8 Hz, 2H), 7.09−7.03 (m, 1.37H), 6.98−6.88 (m, 3H), 6.71 (dd, J = 8.4, 3.0 Hz, 1H), 6.67−6.59 (m, 3H), 3.88 (s, 0.67H), 3.86 (s, 3H), 2.19 (s, 0.94H), 2.10 (s, 3H), 1.83 (d, J = 7.2 Hz, 0.94H), 1.75 (d, J = 7.2 Hz, 3H); $^{13}C\{^1H\}$ NMR (151 MHz, $CDCl_3$) δ 196.5, 195.6, 163.6, 162.8, 153.9, 153.6, 142.4, 140.6, 136.8, 134.8, 132.0, 131.3, 131.1, 130.9, 130.8, 130.7, 129.8, 128.9, 128.5, 128.2, 117.2, 117.0, 114.9, 114.0, 113.9, 113.83, 113.78, 113.4, 55.5, 55.4, 43.1, 18.9, 18.85, 15.6; IR (neat) ν_{max} 3282, 3011, 2921, 1727, 1651, 1617, 1592, 1502, 1418, 1280 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{18}H_{19}O_3^+$ 283.1329, found 283.1338. The −OH proton is not detected by ^1H NMR.

*2-(5-Hydroxy-2-methylphenyl)-1-(4-methoxyphenyl)but-2-en-1-one (**2ac**).* Following the general procedure, compound **2ac** (73 mg) was obtained in 86% overall yield (inseparable mixture of diasteriomers): colorless solid; mp = 164−166 °C; R_f = 0.34 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (600 MHz, $CDCl_3$) δ 8.03 (d, J = 8.4 Hz, 0.11H), 7.99 (d, J = 9.6 Hz, 0.81H), 7.80 (d, J = 9.6 Hz, 2H), 7.05 (t, J = 8.4 Hz, 1.18H), 6.98−6.88 (m, 3.20H), 6.70 (dd, J = 7.8, 2.4 Hz, 1H), 6.66−6.58 (m, 2.28H), 5.24 (bs, 1H), 5.11 (bs, 0.12H), 4.18 (s, 0.32H), 3.87 (s, 3H), 2.18 (s, 0.28H), 2.10 (s, 3H), 1.75 (d, J = 6.6 Hz, 3H), 1.31 (d, J = 6.6 Hz, 0.20H); $^{13}C\{^1H\}$ NMR (151 MHz, $CDCl_3$) δ 196.4, 195.5, 163.6, 162.8, 153.8, 153.5, 142.4, 140.6, 131.9, 131.1, 130.7, 128.3, 117.1, 117.0, 114.8, 114.0, 113.9, 113.8, 113.4, 55.5, 55.4, 43.1, 18.91, 18.86, 15.6; IR (neat) ν_{max} 2985, 2907, 2257, 1737, 1447, 1373, 1235, 1098, 1044 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{18}H_{19}O_3^+$ 283.1329, found 283.1339.

*Synthesis of 2-(5-Hydroxy-2-methylphenyl)-2,3-dihydro-1H-inden-1-one (**3**).* A mixture of **2a** (0.3 mmol, 72 mg) in triflic acid (30 mmol, 2.3 mL) was taken in a screw-cap sealed tube. The reaction mixture was stirred at room temperature for 72 h. Upon completion, the whole mixture was poured into ice−water (30 mL) and extracted with CH_2Cl_2 (15 mL × 3). The combined organic layers were washed with brine (30 mL), dried over Na_2SO_4, filtered, and evaporated to give a residue, which was purified by silica gel (100−200 mesh) column chromatography (hexane/ethyl acetate) to give the desired product **3** in 63% yield (45 mg) as a colorless solid: mp = 166−168 °C; R_f = 0.40 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (400 MHz, $CDCl_3$) δ 8.34 (s, 1H), 7.64−7.58 (m, 1H), 7.52−7.43 (m, 1H), 7.36 (d, J = 7.6 Hz, 1H), 6.84 (dd, J = 8.0, 2.8 Hz, 1H), 6.51−6.44 (m, 1H), 6.31−6.24 (m, 1H), 3.86 (dd, J = 8.4, 4.4 Hz, 1H), 3.56−3.46 (m, 1H), 2.96 (dd, J = 17.2, 3.6 Hz, 1H), 2.73 (bs, 1H), 2.08 (s, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 206.4, 155.1, 153.2, 139.0, 136.1, 134.6, 131.0, 127.2, 126.6, 126.2, 123.6, 114.0, 113.7, 50.3, 35.1, 18.6; IR (neat) ν_{max} 3252, 1679, 1603, 1584, 1500, 1462, 1435, 1381, 1279 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{16}H_{15}O_2^+$ 239.1067, found 239.1080.

*Synthesis of 2-(5-Hydroxy-2-methylphenyl)-1-(4-methoxyphenyl)propan-1-one (**4**).* A mixture of compound **2c** (0.2 mmol, 54 mg) and $NaBH_4$ (0.4 mmol, 15 mg) was taken in a Schlenk tube. To the above mixture was added methanol (2.5 mL) at 0 °C, and the mixture was stirred for 20 h at the same temperature. Upon completion, the reaction was quenched with water (20 mL) and extracted in ethyl acetate (15 mL × 3). The combined organic layers were dried with anhydrous Na_2SO_4, filtered, and concentrated in reduced pressure. The crude residue was purified by silica gel column chromatography (100−200 mesh) to provide **4** in 68% yield (37 mg) as a colorless solid: mp = 163−165 °C; R_f = 0.50 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 7.76 (d, J = 8.0 Hz, 2H), 7.08 (d, J = 8.5 Hz, 1H), 6.79 (d, J = 8.0 Hz, 2H), 6.66 (dd, J = 8.0, 2.0 Hz, 1H), 6.63 (s, 1H), 6.59 (d, J = 2.5 Hz, 1H), 4.67 (q, J = 6.5 Hz, 1H), 3.79 (s, 3H), 2.43 (s, 3H), 1.40 (d, J = 7.0 Hz, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 200.5, 163.3, 154.9, 141.5, 132.0, 130.9, 129.2, 125.7, 114.0, 113.7, 113.6, 55.4, 44.2, 18.6, 18.0; IR (neat) ν_{max} 3317, 1653, 1591, 1511, 1449, 1340, 1303, 1271 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{17}H_{19}O_3^+$ 271.1329, found 271.1342.

*Synthesis of 2-(5-Hydroxy-2-methylphenyl)-1-(4-methoxyphenyl)-3-(p-tolylthio)propan-1-one (**5**).* To a solution of **2c** (0.2 mmol, 54 mg) in $CHCl_3$ (2.5 mL) were added 4-methylbenzenethiol (0.4 mmol, 50 mg) and trimethylamine (0.6 mmol, 83 μL) subsequently. The resulting mixture was stirred at room temperature for 48 h. Upon completion, the crude reaction mixture was purified using column chromatography (hexane/ethyl acetate) on silica gel (100−200 mesh) to afford **5** in 91% yield (72 mg) as a colorless solid: mp = 129−131 °C; R_f = 0.42 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (500 MHz, $CDCl_3$) δ 8.42 (s, 1H), 7.42 (d, J = 8.5 Hz, 2H), 6.92 (d, J = 8.0 Hz, 2H), 6.77 (d, J = 7.5 Hz, 2H), 6.62 (d, J = 9.0 Hz, 1H), 6.51 (d, J = 9.0 Hz, 2H), 6.26−6.15 (m, 2H), 4.44 (dd, J = 9.5, 4.0 Hz, 1H), 3.46 (s, 3H), 3.28 (dd, J = 13.5, 10 Hz, 1H), 2.66 (dd, J = 13.5, 4.0 Hz, 1H), 1.99 (s, 3H), 1.81 (s, 3H); $^{13}C\{^1H\}$ NMR (126 MHz, $CDCl_3$) δ 196.1, 162.5, 155.0, 136.8, 135.9, 131.4, 131.1, 130.5, 129.7, 128.9, 128.8, 124.3, 113.9, 113.0, 112.9, 54.6, 48.3, 37.0, 20.2, 17.6; IR (neat) ν_{max} 3369, 1670, 1597, 1506, 1459, 1412, 1261, 1235 cm^{-1}; HRMS (ESI) m/z $[M + H]^+$ calcd for $C_{24}H_{25}O_3S^+$ 393.1519, found 393.1530.

*Synthesis of (2-(5-Hydroxy-2-methylphenyl)oxiran-2-yl)(4-methoxyphenyl)methanone (**6**).* A mixture of compound **2c** (0.2 mmol, 54 mg) and NaOH (0.6 mmol, 24 mg) in MeOH (2.5 mL) was taken in a Schlenk tube. To the above solution was added 30% aqueous hydrogen peroxide (150 μL) at 0 °C, and the mixture was stirred for 20 h at same temperature. Upon completion, the reaction was quenched with aqueous $Na_2S_3O_2$ solution and then extracted with ethyl acetate (3 × 15 mL). The combined organic layer was dried over anhydrous Na_2SO_4, filtered, and evaporated under reduced pressure. The residue was purified by silica gel (100−200 mesh) column chromatography (hexane/ethyl acetate) to afford product **6** in 98% yield (56 mg) as a colorless gummy liquid: R_f = 0.29 (4:1 hexane/EtOAc) [silica, UV, and I_2]; ^1H NMR (400 MHz, $CDCl_3$) δ 8.03 (d, J = 8.8 Hz, 2H), 7.10 (d, J = 2.8 Hz, 1H), 6.95 (d, J = 8.4 Hz, 1H), 6.82 (d, J = 9.2 Hz, 2H), 6.72 (dd, J = 8.0, 2.8 Hz, 1H), 6.26 (bs, 1H), 3.79 (s, 3H), 3.40 (d, J = 6.0 Hz, 1H), 3.12 (d, J = 5.6 Hz, 1H), 2.24 (s, 3H); $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 194.2, 163.7, 154.0, 135.9, 132.0, 131.8, 129.2, 127.6, 115.7, 114.4, 113.7, 63.7, 55.4, 53.0, 18.8; IR (neat) ν_{max} 3385, 1668, 1598, 1507, 1459, 1307, 1263, 1170 cm^{-1}; HRMS (ESI) m/z $[M + Na]^+$ calcd for $C_{17}H_{16}NaO_4^+$ 307.0941, found 307.0959.

*Gram-Scale Synthesis of α-Aryl-α,β-unsaturated Ketones **2a**/**2c**.* A mixture of alkynyl-cyclohexadienone **1a**/**1c** (1.0 g; 1.0 equiv) and $Cu(OTf)_2$ (10 mol %) in THF (25 mL) was taken in a screw-cap sealed tube. The reaction mixture was heated to 95 °C and stirred overnight. The progress of the reaction was monitored by thin-layer chromatography (TLC) analysis. Upon completion, the reaction mixture was cooled to room temperature, and the crude residue was purified using column chromatography on silica gel (100−200 mesh) to provide the desired α-aryl-α,β-unsaturated ketones **2a** and **2c** in 90% (0.9 g) and 93% (0.93 g) yields, respectively.

■ ASSOCIATED CONTENT

Supporting Information

The Supporting Information is available free of charge at https://pubs.acs.org/doi/10.1021/acs.joc.1c00290.

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Detailed spectra (^{1}H, ^{13}C, and ^{19}F NMR) and X-ray crystallographic data (PDF)

Accession Codes

CCDC 1947873, 2054259, and 2060957 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge via www.ccdc.cam.ac.uk/data_request/cif, or by emailing data_request@ccdc.cam.ac.uk, or by contacting The Cambridge Crystallographic Data Centre, 12 Union Road, Cambridge CB2 1EZ, UK; fax: + 44 1223 336033.

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Notes

The authors declare no competing financial interest.

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