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Recyclable task-specific acidic ionic liquid [NMP]H_2PO_4: Microwave-assisted, efficient one-pot, two-step tandem synthesis of fused thiazolo[2,3-*b*]quinazolinone and thiazolo[2,3-*b*]quinazoline derivatives

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Abstract A novel, time-effective, eco-conscious and microwave-assisted tandem one-pot, two-step reaction has been described for the synthesis of thiazolo[2,3-*b*]quinazolinone (**4a–f**) and thiazolo[2,3-*b*]quinazoline (**5a–t**) derivatives in quantitative yield in the presence of inexpensive, acidic task-specific ionic liquid [NMP]H_2PO_4. All the synthesized compounds were well established by comparison with their literature values (^{1}H NMR, melting points, mass spectrometry and elemental analysis). The remarkable advantages of this methodology over existing conventional heating, such as increasing yields, decreasing reaction times, formation of products in an analytically pure form, operational simplicity, less energy consumption, cost-effectiveness, recyclability and reusability of the catalyst, make this protocol "green" and environmentally benign.

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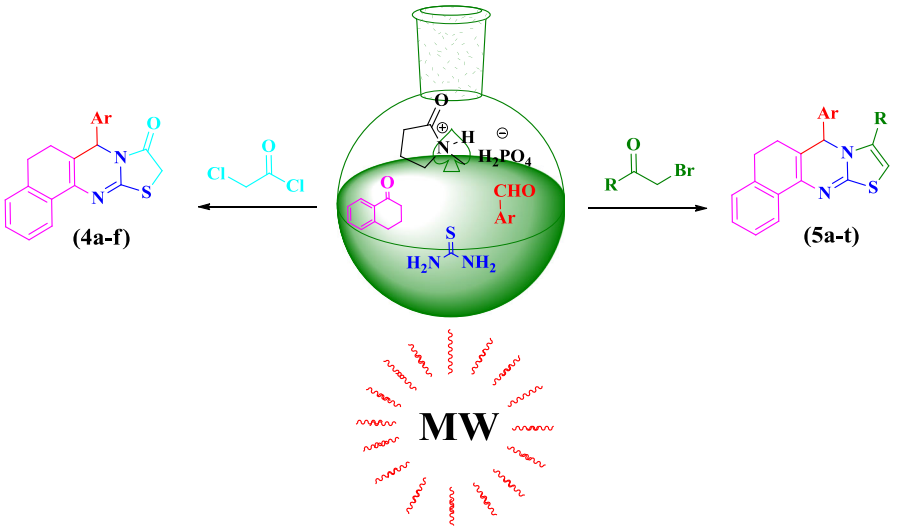
Graphical Abstract



Keywords Green chemistry · *N*-Methyl-2-pyrrolidonium dihydrogen phosphate · Microwave irradiation · Multi-component reaction · Solvent-free

Introduction

Nature has provided a beautiful atmosphere for all living beings to lead their life healthier. But unfortunately, the most polluting species, mankind, has been damaging the atmosphere by exploiting and polluting the environment by consuming all the non-recyclable energy resources and dumping hazardous waste materials. Hence, protecting and nurturing our mother atmosphere, thereby giving a healthy environment and energy resources to our future generations, is an emerging challenge to the scientific community by following the basic principles of green chemistry [1–3].

In development of green approaches, during the past decades, many new synthetic methodologies [e.g., the multi-component reaction (MCR) approach, solid phase synthesis, ultrasonication, microwave irradiation, aqueous medium reactions, solvent-free reactions, using ionic liquids (ILs) as duel solvent-catalysts and phase transfer catalysis] and analytical techniques (grinding and micellar catalysis) have been developed and employed in synthetic organic chemistry, focused towards designing more environmentally sound and green procedures.

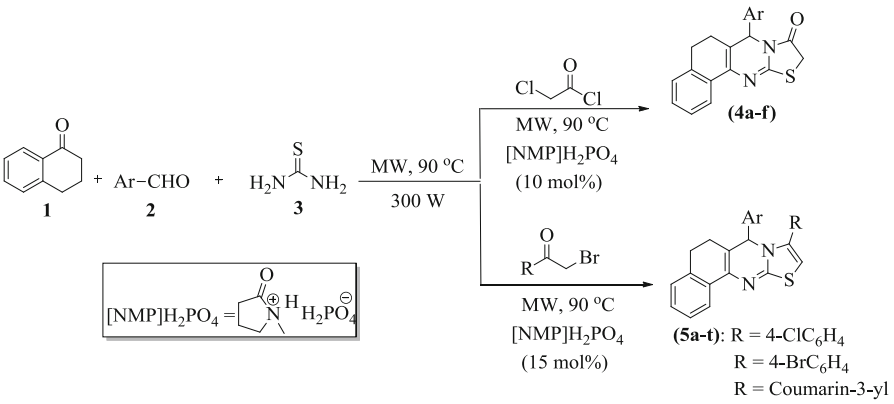
In this context, MCRs [4] have emerged as one of the most powerful strategies that involves more than two easily accessible reactants to give multi-functionalized complex structures in a single synthetic operation. This simple atom economy and time-saving method became a major tool in the synthesis of diverse combinatorial libraries [5] and complex organic molecules of potential

interest, particularly in the area of drug discovery [6, 7]. However, the multi-component protocol is generally advantageous over stepwise and divergent chemical processes in terms of lower reaction times, rapid reaction rates leading to higher yields, and reproducibility [8].

Among the above-mentioned various synthetic methodologies, microwave-assisted organic synthesis [9] has gained much attention as one of the important alternatives to conventional heating for promoting a variety of organic transformations [10, 11] and also to compensate for drawbacks raised in classical synthesis. Microwave irradiation has been preferred in the scientific community due to its promising advantages, like a dramatic reduction in reaction times by choosing lower energy pathways, selecting a suitable microwave energy and its uniform heat distribution, simple purification steps by reducing the side products, lower energy consumption and higher atom economy via optimized conditions.

From the view of green chemistry, the use of eco-friendly, non-flammable, recyclable, task-specific dual solvent-catalyst ILs [12–14] has shown attractive alternatives to traditional polluting homogeneous and heterogeneous catalysts and volatile organic solvents. The synergistic combination of MCRs and task-specific ILs (TSILs) has already proven to be an outstanding green protocol because of their unique properties, including product distribution, negligible vapor pressure, recyclability, catalyst-immobilization, thermal stability, tunable viscosity, miscibility with water and the ability to associate with reactants during activation with their solvent cavities [15–18].

Due to their widespread biological application, fused thiazolo[2,3-*b*]quinazolinone and thiazolo[2,3-*b*]quinazolines have emerged as important lead molecules in a variety of therapeutic areas. Their efficient synthesis has attracted the attention of synthetic and medicinal chemists due to their broad range of biological activities such as antibiofilm [19], antimicrobial [20], antioxidant [21], anti-inflammatory [22], antitubercular [23], anticancer [24, 25] and antitumor activities [26].



Scheme 1 Synthesis of thiazolo[2,3-*b*]quinazolinone (**4a–f**) and thiazolo[2,3-*b*]quinazoline derivatives (**5a–t**). Reaction conditions: $[NMP]H_2PO_4$ (10 and 15 mol% for compound **4** and **5**, respectively), microwave (MW) irradiation (300 W), temperature (90 °C), 2–8 min, yield (92–98 %)

In our previous work [27, 28], we described the synthesis of compounds **4** and **5** and evaluated them for their biological activity. However, the time and yields of both of the title compounds were found to be good, but not satisfactory. Hence, in order to overcome the time and yield limitations and in search of synergistic and more sustainable synthetic protocols as of earlier work [29–31], we aimed to develop a highly efficient and rapid green method. We report herein an eco-compatible, highly efficient and simple protocol for the synthesis of thiazolo[2,3-*b*]quinazoline (**4a–f**) and thiazolo[2,3-*b*]quinazolinone (**5a–t**) derivatives by combined use of recyclable $[NMP]H_2PO_4$ as a dual green catalyst and microwave irradiation via an MCR approach under solvent-free conditions (Scheme 1).

Experimental

Materials and methods

All solvents and starting materials were purchased from commercial sources (Spectrochem, Sigma-Aldrich, India) and were used as received without further purification. $[NMP]H_2PO_4$ was synthesized according to the literature procedure [32] and used as a task-specific IL for the synthesis of the title compounds. Melting points were taken in an open, glass capillary using a Stuart SMP30 melting point apparatus and are uncorrected. The progress of the reactions was monitored by thin-layer chromatography (TLC; E. Merck, Mumbai, India) and the developed chromatogram was visualized under ultraviolet (UV) light and iodine vapors. The purity and yields of the compounds was estimated on an isolated basis. Infrared (IR) spectra were recorded on a Perkin-Elmer 100S spectrophotometer using potassium bromide (KBr) disks. Proton nuclear magnetic resonance (^{1}H NMR, 400 MHz) spectra were recorded on a Bruker spectrometer using deuterated dimethylsulfoxide (DMSO-d_6) as a solvent; chemical shifts are reported in parts per million (δ) relative to tetramethylsilane [TMS, $(CH3)_4Si$] as the internal standard. Elemental analyses were performed on a Carlo-Erba model EA1108 analytical unit and were within ±0.4 % of theoretical values. Mass spectra were recorded on a Jeol JMSD-300 spectrometer.

General procedure for the synthesis of *N*-methyl-2-pyrrolidonium dihydrogen phosphate $[NMP]H_2PO_4$ acidic ionic liquid

N-Methyl-2-pyrrolidinone (1 mmol) was slowly added drop-wise to a cooled equimolar concentration of phosphoric acid (1 mmol), and the resulting mixture was heated at 80 °C for 24 h. The mixture was cooled to ambient temperature and washed with ether to remove any non-ionic residues. Then the residue was dried under high vacuum at 80 °C on a rotary evaporator until the weight of the residue remained constant. The obtained orange-coloured, viscous IL was characterized by comparing its ^{1}H NMR to that of the authentic sample.

General procedure for the synthesis of thiazolo[2,3-*b*]quinazolinone derivatives (4a–f)

An equimolar mixture of tetralone, substituted aromatic aldehydes, thiourea and acidic task-specific IL $[NMP]H_2PO_4$ (10 mol%) were placed in a 10-mL pressurized vial and subjected to MW irradiation (mono-mode, CEM Discover microwave synthesis system at 300 W) at a temperature of 90 °C for about 2–6 min; after that was added chloroacetyl chloride (1 mmol) and the process continued for the appropriate time, as mentioned in Table 3. After ensuring the completion of the reaction (monitored by TLC), 10 mL of cold water was added to the cooled reaction mixture, the precipitated solid was filtered under vacuum and washed with distilled water, furnishing compound (**4a**–**f**). The residue (water) containing dissolved IL was collected by evaporation under reduced pressure.

Selected characterization data of some of the products are given below.

7-Phenyl-5,7-dihydro-6H-10-thia-7a,11-diaza-cyclopenta[b]phenanthren-8-one ***(4a)*** Orange solid; IR (KBr) υ_{max} (cm^{-1}): 1724 (C=O), 1635 (C=N), 1598 (C=C); ^1H NMR (400 MHz, DMSO-d_6): δ 1.85–1.91 (m, 1H), 2.22–2.30 (m, 1H), 2.56–2.63 (m, 1H), 2.70–2.76 (m, 1H), 4.01–4.13 (m, 2H), 5.65 (s, 1H), 7.11 (d, $J = 7.2$ Hz, 1H), 7.16–7.26 (m, 2H), 7.32–7.37 (m, 5H), 7.78 (d, $J = 7.6$ Hz, 1H); MS (ESI) *m/z*: 333 (M+H); Anal. Calcd. for $C_{20}H_{16}N_2OS$: C, 72.26; H, 4.85; N, 8.43; Found: C, 72.04; H, 4.62; N, 8.20.

7-(3,4-Dimethoxy-phenyl)-5,7-dihydro-6H-10-thia-7a,11-diaza-cyclopenta[b]phenanthren-8-one ***(4d)*** Brown solid; IR (KBr) υ_{max} (cm^{-1}): 1720 (C=O), 1634 (C=N), 1598 (C=C), 1233, 1138 (C–O–C); ^1H NMR (400 MHz, DMSO-d_6): δ 1.93–1.96 (m, 1H), 2.22–2.30 (m, 1H), 2.58–2.65 (m, 1H), 2.70–2.76 (m, 1H), 3.71 (s, 3H), 3.72 (s, 3H), 4.01–4.11 (m, 2H), 5.59 (s, 1H), 6.82–6.93 (m, 3H), 7.11–7.24 (m, 3H), 7.77 (d, $J = 7.2$ Hz, 1H); MS (ESI) *m/z*: 415 (M+Na); Anal. Calcd. for $C_{22}H_{20}N_2O_3S$: C, 67.33; H, 5.14; N, 7.14; Found: C, 67.52; H, 5.27; N, 7.01.

7-(3-Nitro-phenyl)-5,7-dihydro-6H-10-thia-7a,11-diaza-cyclopenta[b]phenanthren-8-one ***(4f)*** Pale yellow solid; IR (KBr) υ_{max} (cm^{-1}): 1719 (C=O), 1634 (C=N), 1606 (C=C), 1528, 1344 (NO_2); ^1H NMR (400 MHz, DMSO-d_6): δ 1.81–1.90 (m, 1H), 2.26–2.34 (m, 1H), 2.57–2.65 (m, 1H), 2.71–2.79 (m, 1H), 4.02–4.13 (m, 2H), 5.93 (s, 1H), 7.12 (d, $J = 7.2$ Hz, 1H), 7.18–7.26 (m, 2H), 7.67–7.82 (m, 3H), 8.17–8.21 (m, 2H); MS (ESI) *m/z*: 378 (M+H); Anal. Calcd. for $C_{20}H_{15}N_3O_3S$: C, 63.65; H, 4.01; N, 11.13; Found: C, 63.50; H, 4.30; N, 11.37.

General procedure for the synthesis of thiazolo[2,3-b]quinazoline derivatives (5a–t)

An equimolar mixture of tetralone, substituted aromatic aldehyde, thiourea and acidic task-specific IL $[NMP]H_2PO_4$ (15 mol%) was placed in a 10-mL pressurized vial and subjected to MW irradiation (as above) at a temperature of 90 °C for about 5–8 min; after that was added substituted phenacyl bromides/3-(2-bromoacetyl)-2*H*-chromen-2-one (1 mmol), and the process continued for the appropriate time, as

mentioned in Table 3. After ensuring completion of the reaction (monitored by TLC), 10 mL of cold water was added to the cooled reaction mixture; the precipitated solid was filtered under vacuum and washed with distilled water, affording (**5a**–**t**). The residue (water) containing dissolved IL was collected by evaporation under reduced pressure.

*9-(4-Chlorophenyl)-7-phenyl-6,7-dihydro-5H-benzo[h]thiazolo[2,3-b]quinazoline (**5a**)* White solid; IR (KBr) $\upsilon_{max}(cm^{-1})$: 1604 (C=N), 824 (C–Cl); ^{1}H NMR (400 MHz, DMSO-d_6): δ 1.76 (t, $J = 7.6$ Hz, 1H), 2.33 (t, $J = 8.0$ Hz, 1H), 2.57–2.79 (m, 2H), 6.16 (s, 1H), 6.84 (d, $J = 6.4$ Hz, 2H), 7.17–7.46 (m, 11H), 7.65 (d, $J = 6.8$ Hz, 1H); MS (ESI) m/z: 427 $[M+H]^+$; Anal. Calcd. for $C_{26}H_{19}ClN_2S$: C, 73.14; H, 4.49; N, 6.56; Found: C, 73.01; H, 4.62; N, 6.78.

*9-(4-Bromophenyl)-7-phenyl-6,7-dihydro-5H-benzo[h]thiazolo[2,3-b]quinazoline (**5h**)* White solid; IR (KBr) $\upsilon_{max}(cm^{-1})$: 1603 (C=N), 578 (C–Br); ^{1H} NMR (400 MHz, DMSO-d_6): δ 1.72–1.80 (m, 1H), 2.28–2.34 (m, 1H), 2.59 (t, $J = 8.0$ Hz, 1H), 2.75–2.81 (m, 1H), 6.15 (s, 1H), 6.84 (d, $J = 7.6$ Hz, 2H), 7.15–7.40 (m, 9H), 7.58 (d, $J = 8.4$ Hz, 3H); MS (ESI) m/z: 472 $[M+H]^+$; Anal. Calcd. for $C_{26}H_{19}BrN_2S$: C, 66.24; H, 4.06; N, 5.94; Found: C, 66.11; H, 4.28; N, 5.71.

*3-(7-Phenyl-6,7-dihydro-5H-benzo[h]thiazolo[2,3-b]quinazolin-9-yl)-2H-chromen-2-one (**5n**)* Pale yellow solid; IR (KBr) $\upsilon_{max}(cm^{-1})$: 1711 (C=O of lactone), 1630 (C=N); ^{1}H NMR (400 MHz, DMSO-d_6): δ 1.76 (t, $J = 6.4$ Hz, 1H), 2.28–2.36 (m, 1H), 2.57–2.65 (m, 1H), 2.77–2.81 (m, 1H), 6.25 (s, 1H), 7.16–7.26 (m, 6H), 7.34–7.49(m, 5H), 7.64–7.89 (m, 4H); MS (ESI) m/z: 461 $[M+H]^+$; Anal. Calcd. for $C_{29}H_{20}N_2O_2S$: C, 75.63; H, 4.38; N, 6.08; Found: C, 75.91; H, 4.52; N, 6.27.

Results and discussion

Optimization of reaction conditions

Our aim to synthesize the title compounds **4** and **5** in excellent yields were achieved by following the steps outlined (Scheme 1). The reaction mixture was exposed to microwave irradiation at 300 W intermittently at 10-s intervals via synergistic effect

Table 1 The effect of catalysts on the model reactions

Entry	Catalyst	Yield[a] (%)/time (min)	
		Model-1	Model-2
1	–	0/60	0/60
2	$[BMIM]BF_4$	42/60	58/60
3	$[BMIM]HSO_4$	56/60	60/60
4	$[HMIM]HSO_4$	72/60	65/60
5	$[NMP]HSO_4$	88/60	73/60
6	$[NMP]H_2PO_4$	91/60	80/60

Reactions were carried out on a 1-mmol scale (entries 1–6, Table 1) by taking 10 mol% of the catalyst

[a] Yields are on an isolated basis

of an IL at ambient temperature (90 °C), affording the final compounds within a very short time (2–8 min) in quantitative yields (92–98 %; Table 1).

In order to find out an efficient and suitable catalytic medium that can achieve the final proposed structures, **4a** and **5a** were examined under different catalytic effects by conducting two model reactions (model-1 and model-2) between tetralone **1** (1 mmol), benzaldehyde **2a** (1 mmol), thiourea **3** (1 mmol), chloroacetic acid (1 mmol) and 4-chloro phenacyl bromide (1 mmol). From that it was clear that when non-imidazolium ILs were employed, the maximum and best yields of about 91 and 80 % (entry 5) and 88 and 73 % (entry 4) of conversion was observed in cases of model-1 and model-2 reactions, respectively (entry 4 and 5, Table 1). In the case of conventional imidazolium ILs (entries 2 and 3), the conversion was only up to 56 and 72 % (model-1), and 60 and 65 % (model-2), but the yields were not satisfactory. Obtaining $[BMIM]BF_4$ was less efficient with conversion of 42 % (model-1) and 58 % (model-2). Before testing the effect of various ILs on the model reactions, initially, we performed the same model reactions under catalytic-free conditions. From that, it was clear that for the transformation of the above model reactions, the presence of catalysts should be necessary. Further, to investigate the optimized reaction conditions, we conducted similar model reactions at different MW frequencies at different catalyst loadings using a variety of solvents, like water, ethanol, acetic acid and acetonitrile. In order to highlight the role of MWs in these systems, we also conducted the model reactions under controlled conditions (in the

Table 2 Optimization of the reaction conditions for the synthesis of compounds **4a** (model-1) and **5a** (model-2)

Entry	Catalyst loading $[NMP]H_2PO_4$ (mol%)	Solvent	Temp (°C)/ power (W)	Time (min)		Yield[a] (%)	
				Model-1	Model-2	Model-1	Model-2
1	5	–	–	60	60	40	38
2	10	–	–	30	30	91	80
3	5	–	70/200	15	17	65	54
4	10	–	70/200	9	15	91	70
5	15	–	70/200	12	10	73	83
6	20	–	70/200	10	12	88	62
7	30	–	70/200	20	22	85	72
8	10	–	90/300	2	9	98	85
9	15	–	90/300	10	5	81	92
10	15	Water	90/300	45	42	20	15
11	15	Ethanol	90/300	30	32	65	33
12	15	Acetic acid	90/300	17	22	85	72
13	15	Acetonitrile	90/300	20	21	70	62
14	15	–	100/300	10	11	80	69
15	15	–	120/300	10	13	78	71

Reactions were carried out on a 1-mmol scale (entries 1–13, Table 2) by taking ionic liquids at different catalytic loads and at different reaction conditions

[a] Yields are on an isolated basis

absence of MW irradiation); from that, we noticed that rapid heat transfer facilitated by MW heating allows the chemical transformations to proceed very rapidly compared to that of conventional heating, thereby limiting the formation of side products and considerable improvement in the product yield. The high heating efficiency of microwaves provides low catalyst loading, remarkable rate enhancement and a dramatic reduction in reaction time. The above results revealed that the optimized results were obtained at 90 °C under solvent-free conditions at 10 mol% of $[NMP]H_2PO_4$ for compound **4a** (98 %) and 15 mol% of catalytic load for

Table 3 Synthesis of benzo[*h*]thiazolo[2,3-*b*]quinazolinone (**4a–f**) and benzo[*h*]thiazolo[2,3-*b*]quinazoline (**5a–t**) derivatives

Analogs	Ar	R	Time (min)	Yield[a] (%)	Melting point (°C)	
					Observed	Lit value
4a	C_6H_5	–	2	98	191–193	192–194
4b	4-OHC_6H_4	–	4	96	286–288	285–287
4c	4-$OCH_3C_6H_4$	–	3	96	180–182	179–181
4d	3,4-$(OCH_3)_2C_6H_3$	–	4	95	121–123	122–124
4e	4-ClC_6H_5	–	6	93	210–212	208–210
4f	3-$NO_2C_6H_4$	–	6	92	212–214	214–216
5a	C_6H_5	4-ClC_6H_4	5	92	318–320	319–320
5b	4-OHC_6H_4	4-ClC_6H_4	6	94	282–294	292–294
5c	4-OH-3-$OCH_3C_6H_3$	4-ClC_6H_4	5	95	271–272	271–273
5d	4-$OCH_3C_6H_4$	4-ClC_6H_4	5	94	259–260	260–262
5e	3,4-$(OCH_3)_2C_6H_3$	4-ClC_6H_4	5	94	231–233	233–236
5f	4-FC_6H_4	4-ClC_6H_4	8	92	300–301	301–303
5g	4-ClC_6H_4	4-ClC_6H_4	8	92	315–317	317–318
5h	C_6H_5	4-BrC_6H_4	7	96	322–323	322–324
5i	4-OHC_6H_4	4-BrC_6H_4	6	96	296–298	294–296
5j	4-OH-3-$OCH_3C_6H_3$	4-BrC_6H_4	6	93	281–283	280–282
5k	4-$OCH_3C_6H_4$	4-BrC_6H_4	6	97	260–261	261–263
5l	3,4-$(OCH_3)_2C_6H_3$	4-BrC_6H_4	7	94	242–244	242–244
5m	4-FC_6H_4	4-BrC_6H_4	8	92	298–299	298–300
5n	C_6H_5	Coumarin-3-yl	8	96	289–291	290–291
5o	4-OHC_6H_4	Coumarin-3-yl	7	95	292–294	293–294
5p	4-OH-3-$OCH_3C_6H_3$	Coumarin-3-yl	7	96	260–261	261–263
5q	4-$OCH_3C_6H_4$	Coumarin-3-yl	5	94	273–275	275–277
5r	3,4-$(OCH_3)_2C_6H_3$	Coumarin-3-yl	5	97	266–268	267–269
5s	4-FC_6H_4	Coumarin-3-yl	8	92	279–281	277–279
5t	4-ClC_6H_4	Coumarin-3-yl	8	94	280–281	280–282

Reaction conditions: tetralone (**1**, 1 mmol), substituted aromatic aldehydes (**2**, 1 mmol), thiourea (**3**, 1 mmol), chloroacetyl chloride (1 mmol) and substituted phenacyl bromides/3-(2-bromoacetyl)-2*H*-chromen-2-one (1 mmol), $[NMP]H_2PO_4$ (10 and 15 mol% for the synthesis of compounds **4** and **5**, respectively), MW irradiation (300 W), temperature (90 °C), 2–8 min, yield (92–98 %)

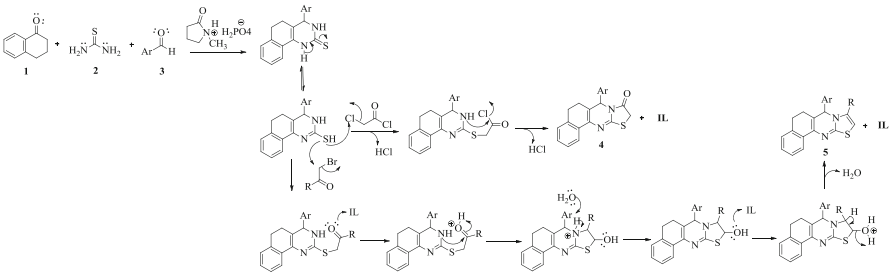
[a] Yields are on an isolated basis

compound **5a** (92 %) at a microwave frequency of 300 W. The results are illustrated in Table 2.

Utilizing the above optimized conditions, the scope and efficiency of the procedure was explored, whereby the procedure successfully synthesized structurally diverse thiazolo[2,3-*b*]quinazolinone **4** (**a**–**f**) and thiazolo[2,3-*b*]quinazoline **5** (**a**–**t**) derivatives in excellent yields (92–98 %) within a very short reaction time (2–8 min; summarized in Table 3). All the synthesized compounds were well established by spectral and elemental analysis and also by comparison with their literature melting points [27, 28] (see Supporting file). A plausible mechanism for the formation of the fused thiazolo[2,3-*b*]quinazolinone and thiazolo[2,3-*b*]quinazoline derivatives is illustrated in Scheme 2.

Recovery and recyclability of the catalyst

One of the important issues in green synthesis is catalyst recovery. To further investigate the recyclability of the IL [NMP]H_2PO_4, distilled water (10 mL) was added to the cooled reaction mixture after completion of the reaction. The separated crude solid product was filtered and washed twice with distilled water (2 × 5 mL). The residue (water) containing dissolved IL with halide impurities was collected by evaporating the solvent under reduced pressure and washed with dichloromethane (2 × 10 mL). Further, to the IL was added *tert*-butanol to strip out the halide impurities (chloride and bromide) as volatile *tert*-butyl halides, which can be pumped out. Also, water was added to the IL to drive off *tert*-butyl halides remains as azeotropes. Finally, the regenerated halide-free IL (orange colored viscous IL) was dried under reduced pressure and titrated against $AgNO_3$ to confirm the absence of halides. Then, the catalytic activity of recycled IL was checked for about five cycles at the same optimised conditions for the same model reactions (Table 2); the results are summarized in Table 4. From the results, it was confirmed that the recycled IL showed considerable catalytic activity and can be reused effectively up to four cycles without loss of its catalytic activity. But, after performing the 5th recyclable cycle, a considerable decrease in the yields was observed.



Scheme 2 Proposed reaction mechanism for the synthesis of title compounds **4** and **5** in the presence of [NMP]H_2PO_4 ionic liquid (IL)

Table 4 Reusability of $[NMP]H_2PO_4$ in the synthesis of title compounds **4a** and **5a**

Run	Reaction time (min)	Yield[a] (%)	
		Model-1	Model-2
1	2	98	88
2	2	97	82
3	2	94	81
4	2	91	83
5	2	76	65

Reactions were carried out on 1-mmol scale (entries 1–4, Table 4) by taking 10 mol% of the catalyst at optimized conditions

[a] Yields are on an isolated basis

Conclusions

In summary, our newly developed protocol using task-specific acidic IL $[NMP]H_2PO_4$ under microwave irradiation in a one-pot process via an MCR approach is an efficient, simple, rapid and environmentally benign procedure for the quantitative and qualitative synthesis of a series of thiazolo[2,3-*b*]quinazolinone and thiazolo[2,3-*b*]quinazoline derivatives. This method is complementary to the classical method and offers advantages over conventional approaches in terms of yield, time and operational simplicity. The non-imidazolium IL $[NMP]H_2PO_4$ is recyclable and can be reused as a catalyst, effective for about four cycles.

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