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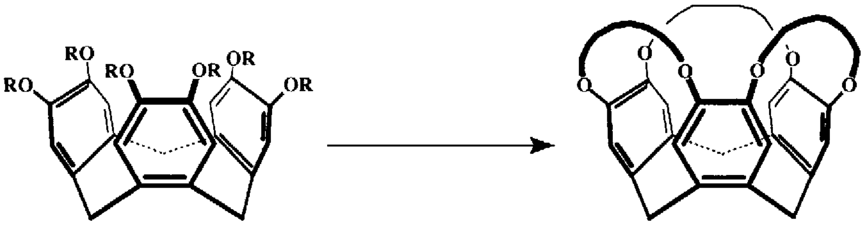
Cyclotriveratrylene As Preorganizing Matrix : A New Tripode Ligand.

Jennifer A. WYTKO et Jean WEISS *
Laboratoire d'Electrochimie et de Chimie Physique du Corps Solide,
Unité de Recherche Associée au CNRS n° 405 , Faculté de Chimie, 1 rue Blaise Pascal
F-67008 Strasbourg Cedex

Abstract : *The synthesis of a tripode ligand combining three pyridine rings arranged around a rigid derivative of cyclotriveratrylene is described.*

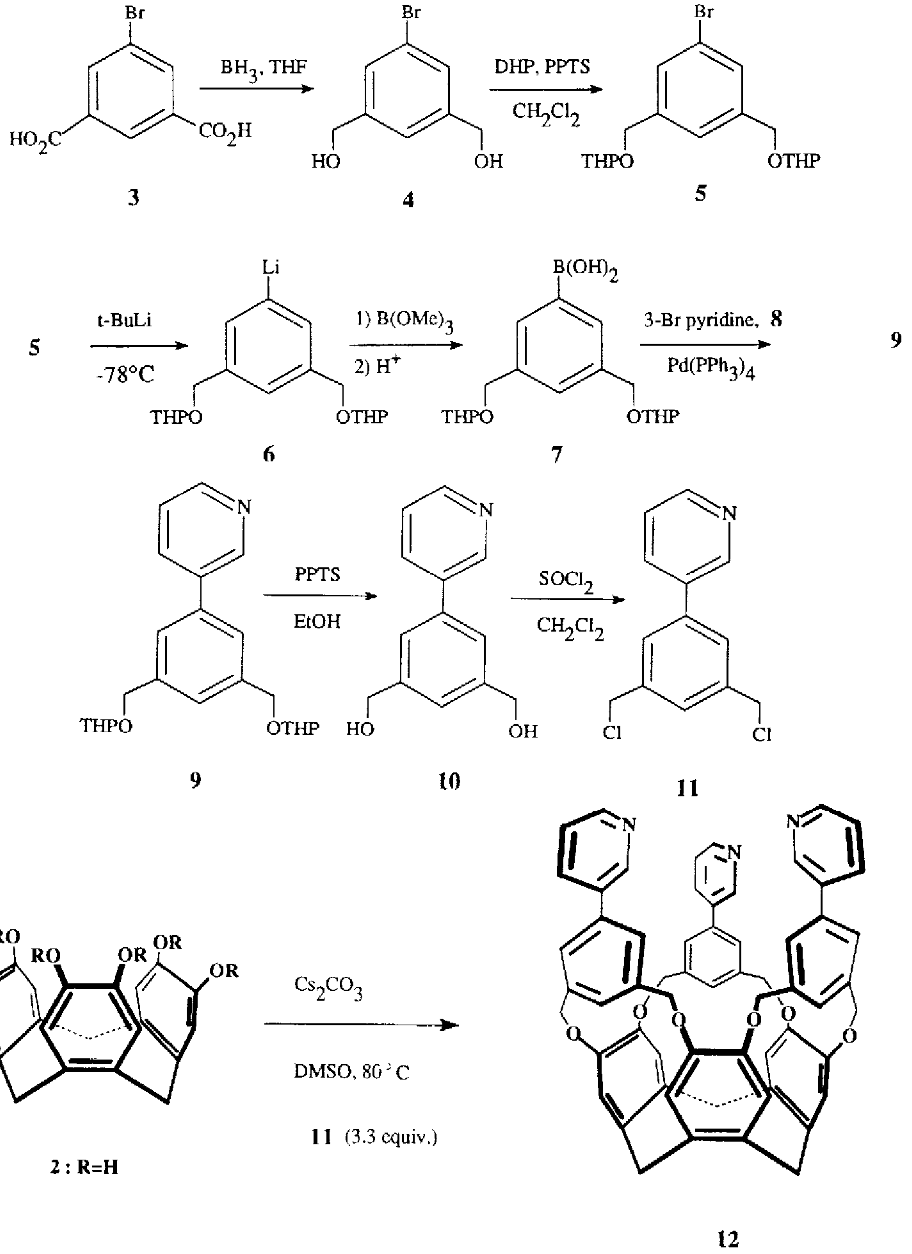
During the past decade, many different rigid organic moieties have been used for preorganizing binding groups[1]. From simple spiro bridges[2] or naphtalene units[3] to complicated basket-shaped hosts[4], cyclophanes[5], or catenanes[6], various molecular architectures have been used to adjust the shape and size of hosts to the targetted guests. Among the concave hosts for neutral molecules like cyclodextrines[7], calixarenes[8], or cavitands[9], which have found many applications due to their enforced lipophilic cavities, cyclotriveratrylene[10] (CTV) has never been used as a matrix for preorganizing binding sites for transition metals. We report hereafter, the synthesis of a tripode cleft containing pyridines as binding sites and CTV as a matrix.

On CTV **1**, the shell inversion[11,12], can be blocked by expansion of the concave surface, bridging two oxygens of two different catechol subunits of **2**[13].



1 : R=Me
2 : R=H

Structural data about the tribridged compounds previously reported[12] have suggested a C_{3v} symmetry for the cyclization products in the case of substituted *m*-xylenes. A pyridine ring has been connected to a *m*-xylene derivative and the bridge **10** has been prepared in order to attach three pyridines to the CTV matrix.



As described, the 5-bromo isophtalic acid **3**[13] was reduced to the corresponding diol **4** by an excess of BH_3.THF complex (refluxing THF, 4 hours), in 75% yield. The diol **4** was protected with dihydropyran (PPTS: pyridinium *p*-toluene sulfonate, CH_2Cl_2, 12 hours, room temp.) in 98% yield. Treatment of the bromide **5** with 2 equivalents of *t*-BuLi (-78°C, THF) generated a purple solution of the lithio derivative **6** which was readily quenched with an excess of $B(OMe)_3$ (THF, -78°C). Warming up to room temperature and hydrolysis of the boronate with 5% HCl afforded the boronic acid **7** in 42% yield after acid/base extraction as purification. Crude **7** was then used in a "Suzuki coupling" reaction[14] with 3-bromo pyridine to yield **9** in 89% yield. The protecting group was removed in refluxing ethanol (PPTS, 12 hours) to produce the diol **10** in 93% yield. The corresponding dichloride **11** was obtained in 82% yield by treating **10** with an excess of thionyle chloride (CH_2Cl_2, NEt_3 traces). The bridging reaction on **2** was performed under high dilution conditions using a 10 fold excess of Cs_2CO_3 and a four fold excess of bridge **11** in DMSO. The tripode **12** was isolated in 40% yield after chromatography over silica gel (CH_2Cl_2, 1% MeOH) as a white powder.

Coordination chemistry of **12** and extension of the method to other binding groups are under progress.

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15. ^{1}H NMR of **12** ($CDCl_3$, 200 MHz) ppm : 8.62 (s, 3H, H_2 pyridine), 8.45 (d, J= 4.0Hz, 3H, H_6 pyr), 7.68 (d, J= 3.8Hz, 3H, H_4 pyr), 7.66 (s, 6H, ArH xylene), 7.39 (s, 3H, ArH xyl), 7.11 (dd, J_1= 4.0Hz, J_2= 3.8Hz, H_5 pyr), 6.69 (s, 6H, ArH CTV), 5.17 (s, 12H, $ArCH_2$ xyl), 4.49 (d, J= 14.0Hz, 3H, $ArCH_2$ CTV), 3.28 (d, J= 14.0Hz, 3H, $ArCH_2$ CTV); Melting Point : 265-267°C; Mass Spectroscopy : Calculated Mass for $C_{60}H_{45}N_3O_6$: 904.4, found : 904.1 (100%) FAB Positive I=2.4V.

16. All new compounds except **7** have given satisfactory NMR, mass measurements and elemental analysis data. Compound **7** was used as crude compound.

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