

Porous Aromatic Frameworks - A new black stuff to consider

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Porous aromatic frameworks (PAFs) have attracted recently a lot of attention. It comprises a sub-class of porous materials in between porous polymers and porous carbons, and PAFs are as black as the latter. Their texture may show some regular order, but in many cases they should be considered amorphous.

PAFs are synthesized by coupling (e.g. Suzuki-Miyaura coupling) of aromatic moieties resulting in 3D networks of high stability. Depending on the building blocks used tuning of porosity is possible, and heteroatoms (N, O) can be incorporated, providing anchoring points for functionalization and metal complexation. Two new PAFs of different porosity are presented which could be sulphonated yielding highly active acid catalysts, of higher thermostability than commercial polymeric state of the art catalyst. Sulphonation increased significantly the porosity of the material.

Using pyridine and nitril bearing aromatic reactants results in covalent triazine frameworks (CTFs). Besides exhibiting an intrinsic basicity, the bipyridin moieties in the CTF allow binding of metal complexes, resulting in heterogenized molecular catalysts. After coordination of Ir^{III}Cp* (Cp*=pentamethylcyclopentadienyl) to a mesoporous CTF (1800 m²/g) a highly active catalyst (Ir@CTF) is obtained for the formation of formic acid and its decomposition for hydrogen delivery. Formulation into particulate material and coating of monolith structure opens practical applicability of these materials.

In addition to this practical topic a modeling study was performed, comparing the N₂ and Ar adsorption in layered graphene structures of varying slit-widths. The theoretical geometric surface area is compared with the classical BET analysis method, the Langmuir model and the Excess Sorption Work (ESW) method. The physical significance of the derived surface areas highly depend on the pore size. Some guidelines are given for the interpretation of these model outcomes.

Reference(s)

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