

Chemically stable urea based COF for size selective heterogeneous catalysis

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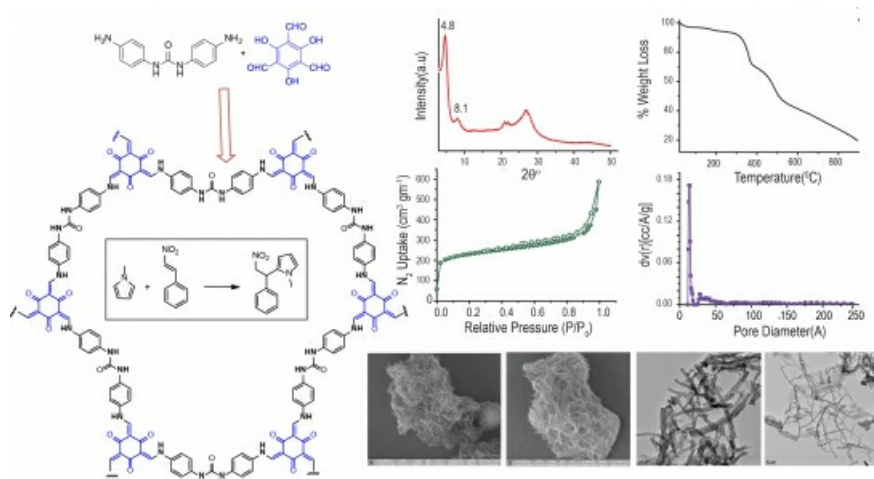
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Covalent Organic Frameworks (COFs) are the class of porous polymer constructed through reversible covalent bond by organic linkers in a periodic manner.¹ The structure and pore size of covalent organic frameworks can easily be tuned using reticular chemistry. COFs have already been widely used for different applications like gas storage, sensing, opto-electronics and catalysis.² Although impressive progress has been achieved in the field of heterogeneous catalysis using modified zeolites and metal-organic frameworks (MOFs), improving the functions of the pores in COFs for better catalytic performance and selectivity still remains a major challenge.³ Herein, we have first time developed urea based COF TpMU for size selective heterogeneous catalysis. TpMU is synthesized by simply reacting reacting with 1,3,5-triformylphloroglucinol (Tp) with 1,3-bis(4-aminophenyl)urea(MU) solvothermal condition and thoroughly characterized by several experimental techniques such as PXRD, FT-IR, SEM TEM and 13C NMR analysis. The intense peak at 4.80 (2 θ) corresponding to 100 reflection plane shows high crystallinity of TpMU, and the reflection 110 and 200 planes are coming together at 8.20 (2 θ) and the peak arising at 27.23 (2 θ) is corresponding to 001 plane. The TpMU follows the type IV reversible N₂ adsorption isotherm, which reflects microporous nature of TpMU. The Brunauer-Emmett-Teller (BET) surface area of TpMU is found to be 1014 m² g⁻¹. The high surface area of TpMU could be due to its high crystallinity and exposed pore structure, which may originate from strong π - π stacking interactions between the layers. The TGA profile shows that the TpMU is thermally stable up to 350 °C. TpMU is also stable in water, 3M HCl, and 3M NaOH. The stable and crystalline nature of the TpMU makes it an ideal material for the heterogeneous catalyst. Notably, TpMU is found to be an excellent reusable size and substrate selective heterogeneous catalyst for Henry reaction with high turnover number.

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[3] Roberts J. M. et al. J. Am. Chem. Soc. 2012, 134, 3334-3337



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