Defect engineering of MIL-100(Fe) framework and its application for toluene adsorption

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Defected-framework of MIL-100(Fe) was successfully prepared by one-step synthesis of hydrothermal reaction via mixing two organic linkers of trimesic acid (H_3BTC) and isophthalic acid (iso-H_2BDC) together. The defective framework of MIL-100(Fe) was systematically investigated by analysing porosity, crystallinity, morphology and thermal stability. In order to estimate efficient defect, a series of obtained adsorbents was applied for gaseous toluene adsorption at ambient condition. The results showed that the adsorption capacity of defected-MIL-100(Fe) was higher than that of original MIL-100(Fe) due to increased unsaturated metal sites, forming p-complexation between toluene and open metal sites (Fe-ions). Moreover, the adsorbent with varying 30% mole of iso-H_2BDC with H_3BTC showed adsorption capacity which increased around 33% in comparison with that of MIL-100(Fe). This defect engineering could be applied for various MOFs to increase adsorption site as open metal site.