

Mesoporous, 2D Hexagonal Carbon Nitride and Titanium Nitride/Carbon composites

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A mesoporous carbon nitride and titanium nitride/carbon composite with 2D hexagonal symmetry was synthesized using SBA-15ht as template. The first nanocasting step yield a carbon nitride replica as array of C₃N₄ nanorods, with a lattice distance reflecting that of the SBA-15ht template but with a considerable shrinkage in diameter compared to the size of the cylindrical pores of the silica. In a second nanocasting step, this carbon nitride was used as “reactive template”. Filling of the carbon nitride with a solution of a titania precursor first introduced a mesostructure into the formed amorphous titania. During heating the carbon nitride secondly act as nitrogen source and converts the titania into titanium nitride, with some residual carbon supporting the structure. Thus, combining multiple and reactive templating a titanium nitride/carbon composite was prepared, exhibiting a mesostructure which, beside some shrinkage, forms a copy of the original silica template used, namely SBA-15. The so prepared titanium nitride/carbon exhibits cylindrical pores with a diameter of 7.3 nm arranged in a 2D hexagonal fashion and a surface area of 438.9 m²/g.