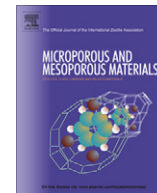


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Au/TiO₂ catalysts encapsulated in the mesopores of siliceous MCM-48 – Reproducible synthesis, structural characterization and activity for CO oxidation

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ABSTRACT

A synthesis route leading to Au/TiO₂ clusters engaged in the three-dimensional channel system of siliceous MCM-48 was thoroughly studied to ensure reproducibility. Intermediate and final products were characterized by XRD, nitrogen physisorption, TEM, XPS and EXAFS. Via impregnation of MCM-48 with titanylacetylacetonate and subsequent deposition–precipitation using HAuCl₄, ionic gold was introduced into the matrix, but a minority of the gold ended up in large metal particles on the external MCM-48 surface in the (freeze-dried) samples. The ionic gold underwent gradual autoreduction at room temperature in Ar even under dark conditions, but at 273 K, it may be kept ionic for months. The catalysts exhibited 50% CO conversion between 262 and 282 K, with good reproducibility. In addition, they achieved significant CO conversion with very low activation energy already at temperatures around 220 K; this low-temperature activity was less reproducible. Porosity analysis showed that the pore system was significantly perturbed after the Au introduction step without, however, precluding accessibility of the pore system. Therefore, further modification of the synthesis aiming at the conservation of the pore system may still bear promise for improvement.