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Titanium-Silica Catalyst derived from Defined Metallic Titanium Cluster Precursor: Synthesis and Catalytic Properties in Selective Oxidations

Claudio Evangelisti, Matteo Guidotti, Cristina Tiozzo, Rinaldo Psaro, Nataliya Maksimchuk, Irina Ivanchikova, Alexandr N. Shmakov, Oxana Kholdeeva

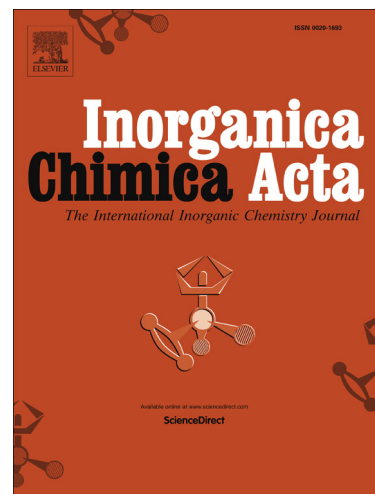
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Titanium-Silica Catalyst derived from Defined Metallic Titanium Cluster

Precursor: Synthesis and Catalytic Properties in Selective Oxidations

Claudio Evangelisti^a, Matteo Guidotti^a, Cristina Tiozzo^a, Rinaldo Psaro^a,
Nataliya Maksimchuk^{b,c}, Irina Ivanchikova^b, Alexandr N. Shmakov^{b,c,d}, Oxana Kholdeeva^{b,c}

a Istituto di Scienze e Tecnologie Molecolari (CNR-ISTM), C. Golgi 19, 20133 Milano, Italy

b Boreskov Institute of Catalysis, Pr. Lavrentieva 5, Novosibirsk, 630090, Russia

c Novosibirsk State University, Pirogova 2, Novosibirsk, 630090, Russia

d Budker Institute of Nuclear Physics, Lavrentieva 11, Novosibirsk, 630090, Russia

Abstract

A class of titanium-grafted mesoporous silica catalysts has been designed and prepared starting from molecularly defined metal clusters. The organosol mixture of zerovalent Ti_{13} clusters was impregnated onto the surface of ordered mesoporous silica molecular sieves (MCM-41 and MMM-2) and, after high-temperature calcination, an evenly dispersed non-single-site $Ti(IV)_nO_x$ -like silica-supported catalyst was obtained. The catalytic solids, fully characterized by microscopic, spectroscopic and porosimetric techniques, showed standard performance in the liquid-phase epoxidation of a cyclic alkene, as limonene, but remarkably high selectivity values in the oxidative carboxylation of styrene, with *tert*-butylhydroperoxide and carbon dioxide in the presence of tetrabutylammonium bromide as a cocatalyst. Unprecedented high yields, up to 67%, in styrene carbonate were achieved after 24 h, under solvent-free conditions. The catalysts displayed also a noteworthy stability of the performance to repeated recovery and reuse cycles.

dedicated to Dr. Carlo Mealli

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