Structural characterization and catalytic properties of bis(1,1,3,3-tetramethylguanidinium) dichromate

The structure of bis(1,1,3,3-tetramethylguanidinium) dichromate was determined from powder X-ray diffraction data. The compound crystallizes in the monoclinic system (space group P21/n) with a = 10.79714 (15) Å, b = 11.75844 (16) Å, c = 8.15097 (11) Å, β = 109.5248 (6)º. The structure consists of dichromate anions (Cr2O7^2-) stabilized by tetramethylguanidinium cations ([H2NC(N(CH3)2)]^+ or [TMGH]^+). Phase transitions of [TMGH]2Cr2O7 were determined by differential scanning calorimetry, thermal gravimetric analysis and in situ Raman spectroscopy, where the decomposition of the matrix into CrOX was found at 171-172ºC. Further heat treatment to above 400ºC resulted in formation of the thermodynamically stable Cr2O3, most likely with the [TMGH]^+ cation as reductant. The catalytic activity of [TMGH]2Cr2O7 supported on TiO2 anatase in the selective catalytic reduction (SCR) of nitrogen oxide was also investigated, however only moderate activity was observed in the temperature range 100-400ºC compared to the activity of e.g. vanadia supported on titania.

General information
Publication status: Published
Organisations: Department of Chemistry, X-ray Crystallography, Centre for Catalysis and Sustainable Chemistry, University of Patras
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Pages: 785-789
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Polyhedron
Volume: 30
Issue number: 5
ISSN (Print): 0277-5387
Ratings:
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 2.1 SJR 0.62 SNIP 0.928
Web of Science (2011): Impact factor 2.057
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
Original language: English
Keywords: Structure, Tetramethylguanidinium, Dichromate, Catalysis, XRD
DOIs:
10.1016/j.poly.2010.12.013
Source: orbit
Source-ID: 274631
Research output: Contribution to journal › Journal article – Annual report year: 2011 › Research › peer-review