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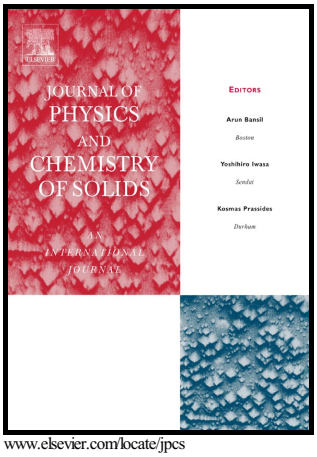

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Structural changes in nanostructured catalytic oxides monitored by Raman spectroscopy: Effect of the laser heating

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Abstract

The laser power effects on the structural properties of nanostructured oxides were studied by Raman spectroscopy. The nanostructured CeO_2, ZrO_2, SnO_2, TiO_2 and MnO_x oxides were prepared by a nanocasting route and characterized through various physicochemical techniques. The structural features of the solids were accompanied by varying the incident laser power from 2.0 to 9.1 mW. The laser caused local heating on the surface of the nanostructured solids and influenced on their particle sizes. The CeO_2, TiO_2 and MnO_x spectra exhibited particle size changes due to thermal effects. Elevated laser power up to 9.1 mW accelerated the sintering of CeO_2, TiO_2 and MnO_x particles in contrast to SnO_2 counterparts. Simultaneously, the creation of defects in the aforesaid oxide structures was suggested upon increasing the laser power from 2.0 to 9.1 mW. The phase transformation from MnO_x-related phases to α-Mn_2O_3 and the oxidation of these phases were observed. Tetragonal ZrO_2 showed a very stable structure under laser heating, envisaging further catalytic applications upon using mild laser power.

Keywords

characterizations; laser power; Raman spectroscopy, nanostructured oxides.

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