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APPLICATION OF CERIA-ZIRCONIA-BASED HIGH-ENTROPY OXIDES AS CATALYSTS IN CONVERSION OF ORGANIC MOLECULES

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Efficient Lewis-acid-catalyzed direct conversion of aldehydes to 1,2-diketones in the liquid phase was enabled by using novel ceria–zirconia-based high-entropy oxides (HEOs) as the actual catalysts. HEOs were synthesized in nanocrystalline powder form using a modified citrate sol-gel route. These compounds were further structurally characterized using powder X-ray diffraction (PXRD), Raman spectroscopy, scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM-EDS), high resolution transmission electron microscopy (HRTEM), BET physisorption measurements and thermogravimetric analysis. The synergistic effect of various cations incorporated in the same oxide structure (framework) was partially responsible for the efficiency of multicationic materials compared to the corresponding single-cation oxide forms. Furthermore, a clear, linear relationship between the Lewis acidity and the catalytic activity of the HEOs was observed. Due to the developed strategy, exclusively diketone-selective, recyclable, versatile heterogeneous catalytic transformation of aldehydes can be realized under mild reaction conditions.

Keywords: Catalysis, High entropy oxides, Lewis acid, Organic conversion

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