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Sol-gel synthesis of ceria-zirconia-based high-entropy oxides as high-promotion catalysts for the synthesis of 1,2-diketones from aldehyde

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Efficient Lewis-acid-catalyzed direct conversion of aldehydes to 1,2-diketones in the liquid phase was enabled by using newly designed and developed ceria-zirconia-based high-entropy oxides (HEOs) as the actual catalysts. 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.

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