DEVELOPMENT OF ZEOLITE-BASED MATERIALS USING NON-CONVENTIONAL PRECURSORS FOR OPTOELECTRONIC APPLICATIONS

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Novel synthetic approaches are nowadays being explored to produce functional porous materials starting industrial waste and natural minerals, also called non-conventional sources. One strategy is the synthesis of zeolite-based materials which can be utilized as (photo)catalyst, adsorbents, or scaffolds for the stabilization of luminescent metal nanoclusters, imparting to such materials an added (ecologic and economic) value. In this study we report on the synthesis and characterization of high chemical and optically-pure zeolites (using clay, sand, clinoptilolite, and a wasted catalyst, as precursors) and their further functionalization with silver clusters that resulted in highly luminescent materials. Two zeolite topologies were synthesized, namely zeolite LTA and zeolite P, depending on the starting precursors, hydrothermal conditions and aging time. Green, yellow and orange emission was observed in LTA zeolites loaded with 10, 20, and 30 %wt of silver ions, respectively. Whereas, blue emission was encountered in zeolite P, regardless of the silver concentration (up to 30 wt%). External quantum efficiencies of Ag-LTA and Ag-P samples amounted up to 15 and 5 %, respectively; opening up new avenues for the further optical optimization of the materials reported in this study and paving the way for their use in solid state lighting applications.

Keywords: Metal nanoclusters, Luminescence, Valorization

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