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Raman spectroscopy study on Cu2ZnSnS4-based nanocrystals and nanocomposites

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The quaternary semiconductor Cu2ZnSnS4 (CZTS) and related compounds is a promising material for photovoltaic applications, thermoelectric and other applications related with alternative energy conversion and storage [1]. Significant research efforts have been made to obtain CZTS with superior structural quality, as well as the development of more efficient characterisation techniques for the detection of structural imperfections and impurity phases [2].
Here, we investigate the CZTS nanocrystals (NCs) obtained by a low-temperature “green” aqueous colloidal synthesis in the form of liquid “inks”. Because most device applications require thin films with well defined parameters, we investigated CZTS NC films formed by drop-casting, spin- and spray-coating, with subsequent thermal or photonic annealing as simple, fast, and scalable fabrication methods. We demonstrate the possibilities of structural characterisation of such NCs, their heterostructures and NC/polymer composites by Raman spectroscopy. [2,3]

Topics

Session A. Physics of condensed matter and spectroscopy

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