Synthesis and characterization of In$_2$O$_3$ nanoparticles

Abstract

Metal-oxide nanostructures have elicited increasing interest in both fundamental and applied sciences. Among metal oxide nanostructures, In$_2$O$_3$ has the potential for use asa semiconductor material. This article provides details on studies carried out thus far for the synthesis and the characterization of In$_2$O$_3$ nanostructures. In this research, various techniques were investigated for the fabrication of diverse and fascinating spherical shaped In$_2$O$_3$ nanostructures. Brunauer-Emmett-Teller (BET) analyses of the In$_2$O$_3$ nanostructures through detailed refinements of the structure of the In$_2$O$_3$ nanoparticles by using the Rietveld method, followed by microstructural analyses using scanning electron microscopy/ transmission electron microscopy (SEM/TEM) and a chemical composition analysis are presented and discussed. Decreasing crystallinity with an improvement in specific surface area was observed from the structural characterization. The energy dispersive analysisresults showed that the as-prepared In$_2$O$_3$ powder sample was stoichiometric, containing almost equal proportions of indium and oxygen. The microstructural analysis (TEM and SEM) demonstrated precise control over the diameters of the nanoparticles, which is an important advantage of the solution combustion approach.