Solid-state synthesis of LnOCl/Ln2O3 (Ln = Eu, Nd) by using chitosan and PS-co-P4VP as polymeric supports

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A series of lanthanide materials of type LnOCl or Ln2O3 (Ln = Eu, Nd) were successfully prepared via a convenient and straightforward two-step procedure. Firstly, and by using chitosan and PS-co-P4VP as polymeric supports, macromolecular complexes of type chitosan·LnCl3 and PS-co-P4VP·LnCl3 were prepared. These macromolecular complexes were treated in solid state at 800 °C under air, leading to the corresponding LnOCl or Ln2O3 materials (Ln = Eu, Nd) with moderate to good yields. The nature of the as-prepared lanthanide materials (LnOCl and/or Ln2O3) is strongly influenced by the polymeric template (i.e., chitosan or PS-co-P4VP), the lanthanide salt precursor, and the polymer/lanthanide molar ratio. Thus, when chitosan·EuCl3 and PS-co-P4VP·EuCl3 are used as macromolecular precursors, a mixture of crystalline phases of both EuOCl and Eu2O3 are obtained. However, when chitosan·NdCl3 and PS-co-P4VP·NdCl3 are used, a sole pure crystalline phase of NdOCl is obtained. The nanostructured lanthanide materials were characterized by means of XRD (X-ray diffraction of powder), SEM, EDS, TEM, and HRTEM. The luminescent spectra of the as-prepared EuOCl/Eu2O3 mixture materials show an emission pattern whose intensity is strongly influenced by the nature of the polymeric precursor, as well as on the metal/polymer molar ratios.

EuOCl/Eu2O3

Lanthanides

Luminescence

NdOCl

Rare earths

Solventless method

Chitosan

Crystalline materials

Europium compounds

Luminescence

Macromolecules

Mixtures

Neodymium compounds

Rare earth elements

Rare earths

EuOCl/Eu2O3

Luminescent spectrum

Macromolecular complexes

Macromolecular precursors

NdOCl

Polymeric precursors

Solid-state synthesis

Solventless method

Chlorine compounds