

Design of $\text{LaPO}_4\text{:Nd}^{3+}$ materials by using ionic liquids.

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Rok wydania

2017

Czasopismo

Optical Materials

Numer woluminu

63

Strony

76-87

DOI

10.1016/j.optmat.2016.09.025

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Monoclinic monazite-type Nd^{3+} -doped lanthanum orthophosphate ($\text{LaPO}_4\text{:Nd}^{3+}$) nanoparticles were prepared by microwave treatment of simple lanthanide precursors such as $\text{Nd}(\text{OAc})_3 \cdot x\text{H}_2\text{O}$, OAc = acetate) with task-specific dihydrogen phosphate ionic liquids (ILs) 1-butyl-1-methylpyrrolidinium dihydrogenphosphate- $\text{BmPyrH}_2\text{PO}_4$ (IL1) and 2-hydroxyethyl-N,N,N-trimethylammonium, $[\text{choline}][\text{H}_2\text{PO}_4]$ (IL2) as the reaction medium, reactant and in-situ nanoparticle stabilizer. This synthesis route possesses many advantages as it is a fast and facile preparation method of the desired phosphate nanomaterials without the necessity for post-reaction heat treatment to obtain the anhydrous high temperature monazite phosphate phase. The nano-sized phosphors $\text{Nd}^{3+}\text{:LaPO}_4$ were carefully analyzed by the powder X-ray diffraction, electron microscopy and spectroscopic techniques taking advantage of the Nd^{3+} spectroscopic probe to analyze in detail the structural properties. Applied high resolution low temperature absorption and emission techniques allowed to complete the structural information unavailable from the XRD powder patterns. A clear influence of the used task-specific dihydrogen phosphate ILs on the structure, morphology, luminescence intensity and lifetimes of the obtained $\text{Nd}^{3+}\text{:LaPO}_4$ was found. It is worth noting that the Nd^{3+} luminescence in LaPO_4 has never been reported up to now.

Słowa kluczowe

orthophosphates, ionic liquids assisted synthesis, neodymium doping, NIR emitting phosphors

Adres publiczny

<http://dx.doi.org/10.1016/j.optmat.2016.09.025>

Plik został wygenerowany dnia 2026-10-08 08:31:20

Adres w repozytorium <https://old.chem.uni.wroc.pl/pl/repozytorium/xaRp7dM>.