Influence of synthesis route and grain size on structural and spectroscopic properties of cubic Nd^{3+}-doped Y_6MoO_{12} nano and micro-powders as optical materials.

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Rok wydania

2019

Czasopismo

Optical Materials

Numer woluminu

90

Strony

300-314

DOI

10.1016/j.optmat.2019.02.021

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

Rare earth (RE)-doped tungstates and molybdates found many applications in the optical field as laser materials, phosphors or scintillators. Especially, there is a huge challenge to fabricate new RE-doped transparent ceramics from nano-crystalline powders, crystallizing in the cubic structure, for application in optics. However, the knowledge about the structure and spectroscopic properties of these materials crystallizing in the cubic structure is very limited. There is therefore a great need to deepen and complete characterizations of new compositions. We are first interested in the most known Nd^{3+} laser dopant. Our research is focused on synthesis, investigation of morphology and spectroscopic properties of Nd^{3+}-doped cubic Y_6MoO_{12} molybdate solid solutions with various concentration of Nd^{3+} optical activator (0.07–10 mol%) in the form of nano-crystalline powders obtained by the combustion method at 600 °C/3 h (grain size 5–10 nm) and annealed at 800 and 1050 °C (grain size 10–20 nm and 35–40 nm, respectively). Obtained samples were compared with micro-powders synthesized by high-temperature solid state reaction at 1550 °C (grain size was 4–5 μm). The detailed XRD analysis of phase transformation with temperature have been performed SEM analysis was performed to confirm the presence of only one phase both for nano and micro-crystalline powders. The powders are homogeneous, porous and if temperature increases, grains tend to agglomerate. Main spectroscopic results are presented in relationship with the average size of grains and the multisite effect of Nd^{3+} ions, observed by site selective and time-resolved spectroscopies, which, in addition, points out evidence of traces of Nd^{3+}-doped Y_2O_3.

Słowa kluczowe

Nd3+ ion, Y6MoO12 molybdate, Cubic structure, Structural probe, Nano and micro-crystallites, Optical materials

Adres publiczny

http://dx.doi.org/10.1016/j.optmat.2019.02.021

Strona internetowa wydawcy

http://www.elsevier.com