Research on the Yb^{3+} ion activated cubic molybdates and molybdato-tungstates for optical transparent ceramics.

Autorzy

Małgorzata Guzik

Magdalena Bieza

Elżbieta Tomaszewicz

Yannick Guyot

Georges Boulon

Rok wydania

2018

Wydawca

Springer

Miejsce wydania

Dordrecht

Strony

315-354

DOI

10.1007/978-94-024-1544-5_17

bookChapter.title

Quantum nano-photonics

ISBN

978-94-024-1543-8

Kolekcja

Naukowa

Język

Angielski

Streszczenie

As widely known, un-doped and rare earth-doped molybdates and tungstates are promising group which have attracted great attention in wide branches of optical material application not only as laser hosts but also as phosphors and scintillators. Most of laser host materials have been obtained as single crystals by Czochralski method. However, the materials in the form of transparent ceramics have comparable or even better important properties than single crystals.

Nowadays, a challenge is to obtain a high quality optical material based on new polycrystalline ceramics applied for laser sources, scintillators and phosphors and to improve manufacturing methods. Nevertheless, only few compositions of cubic transparent ceramics are actually well-developed, these include rare earth (RE^{3+})-doped garnets (Nd^{3+}/Yb^{3+}-doped $Y_3Al_5O_{12}/Lu_3Al_5O_{12}$, Ce^{3+} – doped $Y_3Al_5O_{12}$, fluorides (Yb^{3+}-doped CaF_2), RE^{3+}-doped sesquioxides (Nd^{3+}/Yb^{3+}-doped Lu_2O_3, Sc_2O_3, Y_2O_3) and also perovskite type BMT ($Ba(MgZrTa)O_3$) and un-doped spinel ($MgAl_2O_4$).

This is why our attention is focused on fabrication of new rare-earth doped molybdates or tungstates in the form of polycrystalline ceramics, unknown until now in the literature. The manufacture of ceramics takes less time, even only few days in contrast to 4–6 weeks to grow crystals by using the Czochralski method. In comparison with single crystals it is possible to receive samples highly activated by rare earth ions and of large size ceramics in much cheaper way without using expensive iridium or rhenium crucibles. Indeed, two conditions must be fulfilled to obtain transparent ceramics: the compounds should crystallize in the cubic system and the size of the crystallites must be in the order of tens of nanometers.

Typ publikacji

Rozdział książki

We present and discuss the structural (XRD and SEM analysis) and spectroscopic properties of three types of materials representing the family of Yb^{3+}-doped molybdates and molybdato-tungstates synthesized by the high-temperature solid-state reaction for future new optical ceramics crystallizing in the cubic system: $La_2Mo_2O_9$ /La_2MoWO_9 /Y_6MoO_{12}. Yb^{3+} rare earth ions has been selected since they can be substitute with trivalent La^{3+} and Y^{3+} cations and then can play the role of a structural probe and, in addition, can be used as laser ions in these materials.

Adres publiczny

http://dx.doi.org/10.1007/978-94-024-1544-5_17