NEW GREEN EMISSION IN Ce3+ DOPED YTTRIUM ALUMINIUM PEROVSKITE

J. Mares, M. Nikl, K. Blazek

To cite this version:
J. Mares, M. Nikl, K. Blazek. NEW GREEN EMISSION IN Ce3+ DOPED YTTRIUM ALUMINIUM PEROVSKITE. Journal de Physique IV Colloque, 1991, 01 (C7), pp.C7-421-C7-421. 10.1051/jp4:19917109 . jpa-00250757

HAL Id: jpa-00250757
https://hal.archives-ouvertes.fr/jpa-00250757
Submitted on 1 Jan 1991

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
NEW GREEN EMISSION IN Ce³⁺ DOPED YTTRIUM ALUMINIUM PEROVSKITE

J.A. MARES, M. NIKL and K. BLAZEK*

Institute of Physics, Czechoslovak Academy of Sciences, Na Slovance 2, 18040 Prague 8, Czechoslovakia
*Monokrystaly Turnov, Palackeho 175, 51119 Turnov, Czechoslovakia

Optical properties of Ce³⁺ in yttrium aluminium perovskite (YAlO₃) are known in the VUV, UV and visible ranges in detail [1-3]. There were studied emission properties of several Ce³⁺, (Ce³⁺,Nd³⁺) and (Ce³⁺,Nd³⁺,Cr³⁺) doped YAlO₃ crystals (4f → 5d transitions) together with transfer processes between various Ce³⁺ multisites under hydrogen lamp excitation on the spectrofluorometer Model 139 S Edinburgh Instruments in the UV and visible ranges in this paper.

New Ce³⁺5d → 4f emission band was observed on lightly (∼ ppm) and heavily (∼ 0.5 at. %) Ce³⁺ doped YAlO₃ crystals for the first time. This emission band is broad (from 450 to 550 nm), peaking at 500 nm at room temperature and its intensity increases with Ce³⁺ content. The fluorescence decay measurements show that it is caused by Ce³⁺ ions in YAlO₃ because its fluorescence lifetime is τ ≠ 14 ns which is much shorter than Ce³⁺ fluorescence lifetime in Y₃Al₅O₁₂:Ce where τ ≠ 60 ns. The Ce³⁺ green emission band disappears in YAlO₃:Ce crystals codoped with Nd and Cr.

From spectroscopic measurements the energy level scheme of new Ce³⁺ centres in YAlO₃ crystals was determined. Generally, we can resolve two Ce³⁺ multisites in YAlO₃ from which the first one is radiating in the UV (major centres) and the second one in the green (minor centres). The radiative energy transfer was observed between Ce³⁺ multisites (from Ce³⁺(UV) to Ce³⁺(green) centres). A structure of the Ce³⁺ multisites will be discussed. The Ce³⁺ multisites responsible for green emission could be caused either due to Ce³⁺ pairs (less probable) or due to Ce³⁺ centres where two Ce³⁺ ions are bound via O²⁻ ions from YAlO₃ lattice (more probable case).

REFERENCES