American Mineralogist, Volume 94, pages 771–776, 2009

Inverse spinel structure of Co-doped gahnite

Jasminka Popović,[1,*] Emilija Tkalčec,[2] Biserka Gržeta,[1] Stanislav Kurajica,[2] and Boris Rakvin[3]

[1]Division of Materials Physics, Ruđer Bošković Institute, P.O. Box 180, HR-10002 Zagreb, Croatia
[2]Faculty of Chemical Engineering and Technology, University of Zagreb, Marulićev trg 19, HR-10000 Zagreb, Croatia
[3]Division of Physical Chemistry, Ruđer Bošković Institute, P.O. Box 180, HR-10002 Zagreb, Croatia

Abstract

Powder $ZnAl_2O_4$ (gahnite) samples doped with 0–100 at% Co were obtained by a sol-gel technique. X-ray powder diffraction was used to characterize the samples. Gahnite samples are cubic with the normal spinel structure, space group $Fd\bar{3}m$. Cobalt doping caused a nonuniform increase of unit-cell parameter. The structure of the gahnite samples was refined by the Rietveld method. The location of Co^{2+} was determined by EPR spectroscopy. Cobalt doping of gahnite induces the inverse spinel structure at only 4 at% Co, and the inversion parameter increases with Co^{2+} doping level. Metal-oxide distances in the $(Al,Co)O_6$ octahedra dominantly influence the unit-cell parameter of Co-doped gahnite.

Keywords: Co-doped gahnite, spinel structure, X-ray powder diffraction, Rietveld method