of Mg or Al between the tetrahedral and octahedral sites is almost constant against Ga content in the MgAl2-xGa2xO4 solid solution. A compositional variable of the Ga/(Mg+Ga) ratio in the octahedral site is not influenced by the occupancy of Al. The occupancy of Al is independent of the occupancy of Ga, though it depends on the occupancy of Mg according to thermal history. The local Al-O bond length in the tetrahedral site is 0.15 Å longer than the expected bond length. The nature that Al in spinel structure occupies mainly the octahedral site arises from the character of Al itself.

Keywords: spinel, crystal structure, NMR spectroscopy

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Soft synthesis and crystallographic characterization of calcium magnesium mixed carbonates

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It seems to be generally accepted that smithsonite, magnesite, siderite, as well as mixed carbonates like dolomite (MgCaCO3) or huntite (Mg6(1/2)Ca2(1/2)CO3) have been formed in the nature under hydrothermal conditions. Rao et al. developed a general soft synthesis procedure for obtaining anhydrous carbonates by precipitation from solution at normal pressure. They had success in the synthesis of smithsonite and siderite, but failed in the magnesite synthesis. This finding questions that the hydrothermal synthesis were the only way of genesis of some of these minerals in nature. The scope of this work is to apply the Rao et al. method to the synthesis of double carbonates of general formula MgCa1-xCOx. The compounds obtained have been characterized by X-ray fluorescence, atomic absorption analysis, TG and X-ray powder diffraction. The results obtained clearly demonstrate that anhydrous double calcium magnesium carbonate minerals can be obtained by soft synthesis for x composition ranging from 0 to 0.7. Hydroxysalts instead of anhydrous salts are obtained for larger values of x. The crystallographic parameters of the anhydrous compounds have been calculated and it has been shown that the volume of the cell accomplishes with the Vegard law.

Keywords: alkaline-earth double carbonates, lattice parameters

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Synchrotron X-ray diffraction studies of two olivines from the comet Wild 2

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Oxidation state and distribution of Fe in olivine, M2M10ZnO4, in the anodeite scoria and lava oxidized at high temperature were investigated using FeL/FeL?-intensity ratio, X-ray Rietveld and 57Fe Mössbauer methods. Olivine samples were collected from the reddish black and black scorias, and the reddish black and black Opx-anidesites in Kasayama volcano, Hagi, Yamaguchi Prefecture. The Fe contents of olivine in reddish scoria exceeded 91 mol%, while those of reddish black and black scorias are 83-85 and 79-81 mol%, respectively. The Fe2+-Fe3+ ratios in olivine of black scoria determined using FeL/FeL? -intensity ratio are Fe2+:Fe3+ = 93(3)-99(3):7(3)-1(3), respectively. On the other hand, the Fe contents of olivine in red scoria refined by the X-ray Rietveld method (Rwp = 4.89, Re = 3.79, S = 1.29) are Mg(1)=0.835 (7), Fe(1)=0.165 (7), Mg(2)=0.830 (6), Fe(2)=0.170 (6). The 57Fe Mössbauer spectrum of olivine in the reddish black scoria consists of three doublets which are assigned to Fe2+(M1M2) and Fe3+(M2) in olivine and Fe3+(M2) in lahitune. The Fe2+(M1M2):Fe3+(M2) ratios determined by Mössbauer spectroscopy in the black scoria is Fe2+:Fe3+ = 69:31, and the resulting chemical formula of the olivine is [Mg(0.835)Fe(0.165)6(Fe3+0.030Fe2+0.017)2]2.000Si1.000O4, while the Fe2+:Fe3+ ratio in the red scoria is Fe2+:Fe3+ = 93:7.

Keywords: synchrotron X-ray diffraction, microcrystallography, mineralogy and crystallography using X-ray diffrac