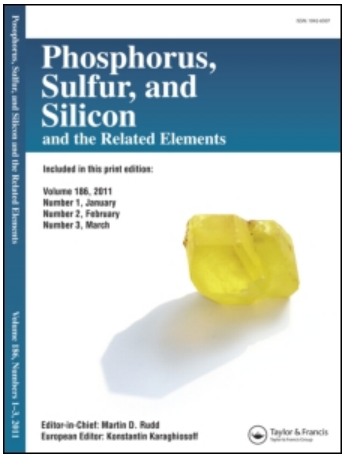

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Paramagnetic Centres in Irradiated Ultraphosphate Glasses Containing Rare Earth Elements

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PARAMAGNETIC CENTRES IN IRRADIATED ULTRAPHOSPHATE GLASSES CONTAINING RARE EARTH ELEMENTS

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In this study three-component ultraphosphate glasses based on Nd, Gd, Ce penta-phosphates were investigated by the EPR method depending on their synthesis conditions. EPR spectra were recorded using a "Radiopan" (Poland) radiospectrometer with a-c-field frequency 9 GHz and modulation frequency 100 kHz at 77 K. The samples were irradiated at γ-^{60}Co source. EPR spectra of unirradiated ultraphosphate glasses synthesized in oxidizing conditions exhibit at broad nonstructural line with $\Delta H_{1/2}$=100 mT which, probably, can be considered as a Gd^{3+} ion cluster. After gamma-irradiation no additive PMC (except hydrogen atoms) arise in these glasses. EPR spectra of nonirradiated glasses synthesized in reductive conditions do not exhibit paramagnetic centres. 4 types of PMC appear in EPR spectra after irradiation: hydrogen atoms doublet with A iso = 50 mT, anisotropic doublet with A_I = 3.7 mT, A_{II} = 4.6 mT and g_{II} = 2.004, g_I = 2.018 which was earlier considered as a phosphor-acid radical PO_4^{2-}, and two doublets with A_I^1 = 75 mT, A_{II}^1 = 90 mT, g_I^1 = 2.036, g_{II}^1 = 2.033, and A_I^2 = 105 mT, A_{II}^2 = 150 mT and g_I^2 = 2.082, g_{II}^2 = 2.077, which can be considered as a hole PMC PO_3^{2-} in different environment. The maximum concentration of these centres does not exceed 10^{15} (absorbed dose 600 kGy/h), and the ratio changes according to glass synthesizing temperature. Thus, ultraphosphate glasses synthesized in oxidizing conditions have a big paramagnetic radiation stability in comparison to analogous glasses synthesized in reductive conditions.