ABSTRACT

Single crystals of pure and neodymium doped calcium hydrogen phosphate; barium hydrogen phosphate and strontium hydrogen phosphate were grown by the single diffusion gel growth technique. Crystals of various dimensions and morphologies were obtained. Most of them are platelet, acicular and spherulites in shape.

Silica gel, obtained from SMS with a strongly acidic anion exchanger in H-form, was used for crystal growth. The growth process involves the diffusion of a cation solution into the gel in which ortho phosphoric acid is impregnated beforehand.

Characterization of the grown crystals was carried out by X-ray powder diffraction, Fourier Transform Infra Red Spectroscopy, Energy Dispersive Spectrum Analysis and X-Ray Fluorescence Spectroscopy. Thermal Analysis which included Thermo Gravimetric Analysis, Differential Thermal Analysis, Differential Thermo Gravimetric and Differential Scanning Calorimetry were also done. The morphology was studied by Optical Microscopy and Scanning Electron Microscopy. In addition, the optical characteristics were studied by UV-Visible spectral studies and the dielectric properties at Microwave frequencies were studied by Cavity perturbation Techniques.

The study of the Liesegang patterns observed during the growth of calcium hydrogen phosphate and strontium hydrogen phosphate crystals in gel medium is also conducted. The generic laws have been verified and the diffusion coefficients were estimated.

Keywords: crystal growth, gel method, Nd$^{3+}$ doping, XRD, FTIR, Thermal analysis, EDS, SEM, Microwave dielectric studies and Liesegang rings.