Abstract No: 109 (Poster) *Natural Sciences*

Modification of apatite from Eppawala rock phosphate deposit (ERPD) to be used in advanced materials: removal of fluoride and particle size reduction

T.P. Gamagedara, H.M.N. Bandara and R.M.G. Rajapakse*

Postgraduate Institute of Science, University of Peradeniya, Sri Lanka,
Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
**rmgr@pdn.ac.lk*

Apatite has more important applications as a vital raw material in orthopedics, dentistry, etc than its traditional use as a fertilizer. Eppawala apatites (EpAp) are chemically identical and basically composed of chlorofluoroapatites and weight percentage of fluoride in EpAp was found as 1.5 – 2.1%. To be used in advanced materials, purification of EpAp will be advantageous. Therefore, in this study, heat treatment of EpAp was carried out to investigate the removal of fluoride and effect on particle size was studied as particle size reduction is beneficial to enhance certain properties.

Physically separated apatites from ERPD were ball milled and heated at different temperatures for different time periods using a thermo gravimetric analyzer (TGA) with monitoring the removal using SPADNS spectrophotometric method as well the weight loss and heat flow, using TGA and DSC curves respectively.

TGA curve of EpAp shows there is a weight loss upon heating after reaching the temperature 700 ^{o}C. According to the SPANDS spectrophotometric analysis, about 8% of fluoride can be removed by heating EpAp to 900 ^{o}C for 1 hour.

According to the TGA curves, percent removal of fluoride can be increased, when sample was kept at 900-1000 ^{o}C for an extended time period. Shifting of broad endothermic peak around 600 ^{o}C, towards higher temperatures and decrease in percent removal with progressive TGA runs for a sample, indicate the difficulty of removal of interior fluorides in the EpAp crystal structure. Powder X-ray diffraction (PXRD) patterns reveal that heat treatment does not effect on the apatite crystal structure. However, calculations of particle sizes along a-axis and c-axis and SEM images show reductions in particle size and some differences in the shapes upon heating. Particle size reduction may be due to the removal of fluoride from their lattice sites of EpAp lattice leading to the breakdown of extended EpAp crystal structures.

Thus, in this simple heating method, F^- removal from EpAp can be achieved around 700 ^{o}C and upon increasing the temperature and duration, the amount removed can be increased and particle size can be reduced. In addition, crystal structure can be maintained up to the studied temperature (~1000 ^{o}C).

Financial assistance from National Science Foundation, Sri Lanka (*RG/2007/FR/08) is acknowledged.*