

The effect of reaction conditions on the precipitation of sodium hexafluorosilicate produced from waste hexafluorosilicic acid

Authors: Marwan M. Batiha, Mohammad Al-Harahsheh

Abstract: The purpose of the study is to investigate the optimum conditions for the precipitation of sodium hexafluorosilicate (Na_2SiF_6) from waste hexafluorosilicic acid, an effluent from the phosphoric acid industry. Sodium chloride and sodium hydroxide were used as reactants to produce Na_2SiF_6 . The effect of various parameters on the precipitation was investigated and includes; the molar ratio of the reactants, contact time, the temperature and the effect of seeding. The optimum reaction conditions were found to be as follows; excess sodium chloride or sodium hydroxide to hexafluorosilicic acid of 25%, contact time 40 minutes and a reaction temperature of 40°C. The reaction of hexafluorosilicic acid with an aqueous solution of sodium chloride at optimum conditions gave a maximum yield of 94.26% Na_2SiF_6 while the reaction of hexafluorosilicic acid with the aqueous solution of sodium hydroxide at optimum conditions gave a maximum yield of 97.3% Na_2SiF_6 . The X-Ray diffraction (XRD) analysis reveals that the only crystals present in the precipitate are Na_2SiF_6 . Also, Scanning Electron Microscope (SEM) analysis shows that the different morphology of these crystals depend on the precipitation conditions.