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Chemical Exfoliation Characteristics of Karakoç Phlogopite in Hydrogen Peroxide Solution

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Abstract: The chemical exfoliation characteristics of phlogopite samples taken from Sivas - Yıldızeli-Karakoç (Turkey) ore were investigated. H_2SO_4 , HCl, HNO_3 , H_3PO_4 and H_2O_2 solutions at varying concentrations were tested for chemical exfoliation and the best reagent for this purpose was determined to be hydrogen peroxide. In the exfoliation tests performed, hydrogen peroxide concentration, temperature and reaction time were observed to be important parameters, with solid/liquid ratio being of minor importance. The exfoliation characteristics of the material increased with increases in hydrogen peroxide concentration and depending on the reaction time (1-30 hours) a maximum value of a 49-fold increase in swelling was obtained in 30% hydrogen peroxide solution at room temperature with a change of the density from 2.75 g/cm^3 to 0.37 g/cm^3 . Although maximum swelling was reached in 30 hours at room temperature in 30% hydrogen peroxide solution, the reaction time was lowered to 70 minutes by an increase in temperature to 60°C . Above 60°C the material started to decompose into fine particles, with complete loss of its characteristics above 80°C . The experimental results were interpreted mathematically and a regression model was proposed to calculate the swelling ratio for any hydrogen peroxide concentration and reaction time at room temperature.

Key Words: chemical exfoliation, hydrogen peroxide, phlogopite, swelling, vermiculite

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