Purification of Kaolin in Meetiyagoda Kaolin Deposit, Sri Lanka by Chemical Treatment for Whiteness Enhancement

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Titanium and iron impurities give deep colorations to Meetiyagoda kaolin. Due to these colorations Meetiyagoda kaolin needs further improvements in most of the applications where the higher whiteness is necessary. The objectives of this research are to identify the impurities in Meetiyagoda kaolin, to purify the kaolin with a chemical treatment, enhance the whiteness and to study the behavior of chemicals with varying concentrations and particle sizes. X-Ray Diffraction analysis identified that rutile, goethite and graphite are containing as impurities in kaolin. Therefore, chemical treatment of potassium persulphate ($K_2S_2O_8$) followed by oxalic acid ($H_2C_2O_2$) was carried out for purifying and enhancing the whiteness of kaolin. To investigate the effect of particle size on the chemical treatment, kaolin was dried, crushed, ground, sieved and separated for five ranges of particle sizes as 1000–500, 500-250, 250-125, 125-63 and less than 63 micron. Each sample was dispersed with sodium silicate (Na_2SiO_3) and treated with potassium persulphate for 2 hrs. Reflectance Spectrophotometer analysis recorded the highest " L " value in Hunter Whiteness index for particle size less than 63 micron. After filtering, drying, crushing and sieving to 63 micron, samples were treated with 0.1 mol dm^{-3}, 0.4 mol dm^{-3} and 0.7 mol dm^{-3} oxalic acid concentrations for 2 hrs. The highest 'L' value was given by 0.7 mol dm^{-3} oxalic treated sample and maximum leaching capacity was recorded as 76.89 mg L^{-1} by Atomic Absorption Spectroscopy analysis. Fourier Transfer Infra-red analysis reveals that some amount of iron was still remaining even after the chemical treatment. However finally the chemical treatment has shown an increment of 2.01 units in L value and decrements of 0.35 units and 1.02 units in "a" and "b" values respectively. The experimental results conclude that the tested purification method can significantly improve the quality of kaolin in industrial point of view.

Keywords: Kaolin, Impurities, Whiteness enhancement