UPGRADING SRI LANKAN NATURAL VEIN GRAPHITE BY PURIFICATION AND SURFACE MODIFICATION

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Sri Lanka is well known for high quality vein graphite, containing about 95-98% of pure carbon. Vein graphite in Sri Lanka have been categorized into four structurally distinct graphite varieties, shiny-slippery-fibrous graphite (SSF), needle-platy graphite (NPG), coarse striated-flaky graphite (CSF) and coarse flakes of radial graphite (CFR). Impurity content in different structural type varies depending on the mode of occurrences and nature of graphite vein. Both chemical and physical methods are employed for removing impurities from the graphite. Among them, flotation is a versatile and selective mineral processing technique, which can be used to achieve specific separations from complex ores. Therefore the present study focuses on purification of Sri Lankan natural vein graphite by froth flotation, HCl leaching and alkali roasting followed by surface modification suitable for advance electrical applications. Graphite powder (<75 µm) from Needle Platy Graphite (NPG) and Shiny Slippery Fibrous (SSF) morphological types were used for this study. Initially 200g from both varieties were subjected to froth flotation. For HCl leaching under the chemical purification study, 3g of each graphite sample was treated with 10 vol. % HCl at 65^0C for 75 minutes. For the alkali roasting, 3g from each graphite sample was mixed with 35vol. % NaOH (solid: liquid = 1:2) separately and roasted at 250 ^{0}C under air for one hour. Selected graphite samples having carbon content about 99.9% were used for surface modification. Thermal oxidation was performed at 550 ^{0}C in a box furnace under air for 6 hours. Under the chemical method, graphite powder (3 g) was treated with 69% HNO_3 (100 ml) under stirring at 60 ^{0}C for 24 hours. Carbon percentage of graphite was determined according to ASTM - 561 and weighing the residues. Filtrates were taken from both chemical purification techniques and analyzed by the Atomic Absorption Spectroscopy (AAS) technique. Both purified and modified graphite samples were characterized by Fourier Transform Infrared (FTIR) spectrophotometer (Nicolet 6700). The electrical conductivity measurements were performed by the d.c. four probe technique. The results revealed that the froth flotation could not make a considerable influence on purification, in contrast, both the acid leaching and alkali roasting methods revealed that Sri Lankan natural vein graphite can be purified over 99% carbon content. The surface modification study shows the formation of oxidized species on the graphite surface and the surface modification by chemical oxidation has a higher effect than the thermal oxidation. Both of the investigated graphite varieties reveal the possessing of electrical conductivity in the semi-conductivity range. Further the purification process improves the electrical conductivity, though it slightly decreases with surface modification.

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