Gravity Separation Method for Purification of Below 2 mm Graphite Particles in *Kahatagaha* Graphite Mine

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Kahatagaha graphite mine is one of the leading graphite mines in Sri Lanka. It produces high-quality vein graphite with a carbon grade over 90%. It is considered as one of the highest-grade vein graphite mine in the world. Pyrite, quartz, chalcopyrite, feldspar are the main associate minerals with vein graphite in *Kahatagaha* mine. Extraction of graphite involves drilling and blasting. Therefore, graphite gets diluted with host rock particles and associate minerals. Extracted graphite is crushed and over size lumps are hand sorted according to carbon grade. Undersize fraction remains unsorted due to the small particle size and crushed to 2 mm size. This fraction is mixed with gangues and further beneficiation is required to remove gangues. Gravity separation methods are considered environmentally friendly and cost-effective over the froth flotation method. Therefore, in this research Wilfley Table and Denver Jig were used as gravity separation techniques to purify below 2 mm size crushed graphite particles. Feed rates, table angles and particle sizes were taken as parameters for Wilfley Table while wash water rate and reciprocating motion keeping constant throughout the experiment. Jigging duration and particle sizes were taken as parameters for jigging while sample amount is keeping constant throughout the experiment. Results show the crushed graphite fraction of 2.0-0.5 mm size range can be upgraded up to 99.5% from initial grade of 85.3% with feed rates of 8.33 g s^{-1} and 4.17 g s^{-1}, table angle of 5° with Wilfley table method. Denver jigging upgraded the carbon content of 2.0-0.5 mm size graphite up to 97.1% but separation is uncertain with the jigging duration. Results concluded that upgrading the carbon content of 2.0-0.5 mm size graphite is possible with both gravity separation methods used in this experiment and Wilfley table method produces the highest efficiency and grade with optimum conditions.

Keywords: Gravity separation, Graphite, Wilfley table