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The Progress of Research on Purification and Modification of Sri Lankan Vein Graphite for Advanced Technological Applications, at NIFS

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Sri Lankan vein graphite is significant for its high crystallinity, high purity, limited occurrence and extensive mineralization. Needle-Platy Graphite, Shiny-Slippery-Fibrous Graphite, Coarse Striated-Flaky Graphite and Coarse Flakes of Radial Graphite are graphite varieties by structurally distinct. Mode of occurrence and nature of graphite vein is caused for impurity content of different structural types. The presence of trace amounts of impurities can cause major changes in chemical and electrochemical activities. National Institute of Fundamental Studies (NIFS) has been working on developing techniques for purification and modification of Sri Lankan vein graphite suitable for advanced technological applications. Raw Sri Lankan natural vein graphite typically consists of 90-99% of carbon, pyrite and dolomite are major impurities. In addressing this, our research at NIFS has developed low cost, eco-friendly physical and chemical methods for purifying vein graphite. Froth flotation is utilized as a physical technique and acid leaching, acid digestion and alkali roasting methods were used as chemical techniques for purification. Hence, our introduced purification techniques could result in purity over 99.99% and these findings were patented. For battery electrode applications, development of these highly purified vein graphite further through surface modification is important. Our research group has also worked on developing low cost methods for surface modification, by developing techniques such as, mild oxidation, acid digestion, microwave irradiation. Our introduced surface modification methods for Sri Lankan vein graphite were success and lead to Sri Lankan patents. Figuring the structural modifications for upcoming batteries of Na and Mg is regard to expand the interlayer space to intercalation between Na⁺, Mg²⁺ ions. Our research group has involved with developing several thermal and chemical methods to modify the structure of vein graphite. They have already shown promising outcome on expanding interlayer space further to intercalate Na⁺ ion. This work is under progressing at our laboratories in NIFS.

Keywords: chemical methods, modification, purification, Sri Lankan vein graphite