Synthesis of Silver - Graphite Composite via Ultrasonication Associated Chemical Reduction and Study of its Antibacterial Properties

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Graphene oxide is widely used to produce an antibacterial silver composite, but mostly required toxic chemicals for production and they are comparatively expensive. The present study was focused on synthesizing cost-effective less hazardous antibacterial composite using vein graphite and silver. Silver graphite composites can be made using various methodologies and those methods can affect the antibacterial property. Therefore, in this study, silver graphite composite was synthesized by ultrasonication associated chemical reduction method. Sri Lankan vein graphite was purified by the patented acid leaching method, then surface modified with patented mild chemical oxidation method. The silver-graphite composite was synthesized from an $AgNO_3$ silver precursor with a concentration of 0.00025 M, 0.001 M, 0.002 M by using tri-sodium citrate as a reducing agent. X-ray Diffractometry analysis indicated that composite only consists of silver nanoparticles and carbon in pure crystalline form. The composite was characterized by Scanning Electron Microscopy. Nano-scale silver particles were seen deposited on the surface of graphite. Antibacterial efficiency of the synthesized composites was analysed using *Escherichia coli* and the test was carried out using the shake flask method. For positive and negative controls, modified graphite and commercial antibiotic ofloxacin were used respectively. The samples were drawn out with a one-hour time interval from 0 to 6 hours and the number of surviving colonies on Eosin Methylene Blue agar was counted after 24 hours of incubation. The removal of the Colony Forming Unit for all samples gave efficiency over 99 %. The Kruskal-Wallis test suggests that colony removal depends on the time and concentration of $AgNO_3$ used in the synthesized composite. Therefore, this study suggested that silver-graphite composite synthesized via ultrasonication associated chemical reduction can be used for *E. coli* as an effective antibacterial agent.

Keywords: Graphite, Silver nanoparticles, Ultrasonication, Chemical reduction, Tri-sodium citrate