THE GEOLOGY OF GRAPHITE MINERALIZATION IN THE BOGALA RANGALA REGION AND THE ORIGIN OF GRAPHITE IN SRI LANKA

A THESIS PRESENTED

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ABSTRACT.

Sri Lanka is one of the best high purity natural graphite producers in the world for a variety of industries, the purity being 95-99 % carbon. Sri Lanka mines its graphite mainly at Bogala and Kahatagaha/Kolongaha (K/K) mines.

The Bogala mine area consists of several well developed deposits including the Rangala mines. Lithologically, these deposits are associated with common rock types such as quatzite, pelitic gneiss, calciphyre and charnockite. Graphite is rare in these rocks. Quartz veins and pegmatites are the most common intrusives in the region and apart from that there are several thin veins of calcite, pyrite, magnetite, chalcopyrite, tourmaline, acidic and basic dykes etc. in the underground openings.

Tectonically, the Bogala-Rangala area is composed of a series of parallel, isoclinal folds and economic ore bodies are found at the hinge surfaces of the tight to closely folded anticlines. The occurrence of the deposits along the hinge surface

is not uniform, depending upon the complexity of the deformation of the anticline such as refolding and buckling of the hinge surface to culminations and depressions. The ore is generally found in the tension and the shear fractures in the axial region of the anticlines, the former being predominant. Normal faulting is common in the veins and the irregular tension fractures along with subsequent faulting have produced the most potential ore bodies.

The graphite deposits are fracture controlled hydrothermal veins. In the shallow horizons, the hydrothermal minerals have been segregated from the graphite, forming quartz rich pegmatitic veins with low grade graphite. The ore has been added to the hydrothermal solutions from a secondary source, presumably, graphite reservoirs formed in the anticlines. This graphite-hydrothermal assemblage has intruded into the fractures in fluid form from time to time with the opening of the preformed graphite veins and crystallized in fibrous form perpendicular to the veins. The crystallization and zoning of graphites with different types in veins are temperature dependant. Generally, there are four types of graphite in the veins - amorphous, needle, flake and platy types.

The development of the graphite rich zones in the anticlines has been controlled by the regional deformation. It is believed that the earlier formed syngenetic graphite seams in the South West (SW) group geosyncline have been mobilized to the structural traps. Moreover, the presence of these graphite layers in foliation has accelerated and intensified the folding, producing characteristict isoclinal fold systems in the SW group. The isolated occurrences of poorly developed graphite in the synclines and also the lenses, vugs, lodes etc. are the remnants of the migration.

The formation of the graphite bearing gneisses in the Highland group has resulted in random deposition of sapropelic detritus in the sediments, perhaps under a turbulent condition in a continental margin, in a depositional environment followed by a metamorphism. The formation of the lithified, syngenetic graphite seams, in the SW group basin has occurred due to the deposition of well sorted sapropelic material in lamination after a prolonge migration to the deep SW basin from the Highland group and subsequent regional metamorphism. This reveals that the graphite in veins, metasediments and vugs, lenses, lodes etc. of Sri Lanka have a common source of carbon as far as their origin is conderned.