A SCIENTIFIC APPROACH TO LOCATE NEW GEM DEPOSITS OF HIGH-GRADE METAMORPHIC TERRAINS WITH SPECIAL REFERENCE TO SRI LANKA

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ABSTRACT

In relation to its surface area, Sri Lanka could be considered as having gem-bearing areas with the highest concentration of gem deposits in the world. Gem mining in Sri Lanka is still based on `hearsay' methods. The application of modern scientific methods to gem exploration is a national requirement. Vast areas of land still remain unexplored for gem deposits.

The study was directed towards development of a geochemical and statistical method to delineate areas that do not have a potential to bear gems from those known to bear gems in Sri Lanka. Drainage basins in seven localities with four levels of known gem potential were selected as test areas. Geochemical differences in stream sediments from areas having a potential to bear gems and those not having a potential to bear gems were successfully identified by a statistical method i.e. discriminant analysis. The discriminant function generated from the data set for the seven test areas was used for this purpose.

The results of the data set for the seven test areas were compared with the stream sediment geochemistry of areas unknown to have a potential for gems in order to determine high gem-bearing areas. The stream sediment gem potential maps of the drainage basins show high, moderate, low and very low/no potential areas. The quantitative distribution of major, minor and trace elements in stream sediments reflects the presence of heavy minerals that are associated with gems.

In earlier studies the Rb/Sr ratio of stream sediments was used to delineate gem bearing areas. Rb/Sr ratios and element distribution patterns were compared with stream sediment gem potential maps to compile gem potential maps of Badulu Oya, Gin Ganga, and Uma Oya.

The validity of the gem potential maps was successfully checked by digging test pits in the areas with high to moderate potential. Twenty four percent of the land surface of the Gin Ganga catchment area shows high to moderate potential. The high to moderate potential areas of other catchment areas were calculated as less than 10% of the total catchment areas.

The study suggests that discriminant analysis of stream sediments, taking into consideration the element distribution patterns and Rb/Sr ratios of stream sediments is a valid method to identify unknown gem-bearing regions with a potential to bear gems.

Occurrences of in-situ corundum deposits are very rare. Such occurrences have special petrological significance and sources of gem minerals as well. The study of two types of in-situ corundum bearing rocks at Rupaha in the Uma Oya catchment area reveals a metasomatic process along with a complex metamorphic history. One occurred with the metamorphosed syenite while the other corundum bearing mineralized zone shows three mineralogically different zones. The corundum probably had formed by the reaction of magnesian skarns with the Al-rich fluids and associated crystalline limestone during the process of metamorphism owing to enrichment of Al in the absence of silica.