D-18: Heavy mineral analysis in exploration for gem minerals in stream sediments

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Gem minerals concentrated in sedimentary deposits are often associated with indicator minerals. There may be rare minerals such as fergusonite, gadolinite, samarskite and niobian rutile; spinels, corundum and zircon are also of importance as indicator minerals. Indicator minerals in the stream sediments can be used as a tool for gem exploration, particularly where there is a good statistical significance in stream sediment mineralogy.

Sediment samples from the Badulu Oya, Belihul Oya and Maha Oya catchment areas were collected for detailed mineralogical analyses. The fact that Maha Oya had not been mined for gems and the other 2 had been, was taken into consideration when selecting these 3 rivers for study, as it was intended to determine whether the heavy minerals in the sediment samples of the rivers differed.

Locations for sampling were selected taking into consideration the size of the catchment areas of the 3 rivers as well as their lengths and flow order. One hundred stream sediment samples were collected from these locations. The size fraction between -177 and +125 μm were subjected to bromoform separation (gravity method) to obtain heavy minerals. The heavy mineral fractions were separated into 5 classes by the magnetic method using the Franz Isodynamic Separator. These fractions were mounted on glass slides using Canada balsam and identified under a microscope. Several opaque grains were identified by X-ray diffractometry.

The analyses revealed that the sediment samples from Maha Oya contained high amounts of hornblende and ilmenite, low amounts of garnet, and no corundum, whereas samples from Badulu Oya and Belihul Oya had high amounts of garnet and considerable amounts of corundum and other gem minerals. The percentages of garnet, corundum, spinel, zircon, tourmaline, sillimanite and topaz in the sediment samples of the 3 rivers differed and this variation was attributable to petrology and geomorphology.

Mineral distribution maps of the 3 rivers were prepared using percentages of indicator and heavy minerals present in all locations. These maps delineated areas which were most suitable for future gem exploration in the Central Highlands.

Financial assistance by International Development Research Centre, Canada for research grant No. 91 - 1023 - 02 is acknowledged.