

Towards a sustainable management of Cobalt ore in Katanga Province (Democratic Republic of Congo): the TRACE project

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The Lufilian fold-and-thrust belt (Katanga Province, Democratic Republic of Congo- DRC) is estimated to hold between a third and half of the world's known cobalt reserves. This non-renewable resource is mainly extracted as a secondary ore deposits, the heterogenite (CoO.OH) resulting from the oxidation of Cobalt sulphide primary bodies. This mineral bears frequently various amounts of Cu, Ni, Fe and Al.

Several years of civil wars and political instabilities in DRC have led to the development of an intensive informal small-scale mining sector associated with social-environmental issues (e.g. poor working conditions, child working in mines, etc) and losses of incomes for the authorities. The TRACE project ("TRACeability of hEterogenite") is sponsored by the Belgian Science Policy and is conducted by the GECO centre ("Geology for an ECONomic sustainable development") and the Task Force MIRECA ("MIneral RESources in Central Africa"). The former aims to develop scientific tools for the sustainable management of natural mineral resources, while the TF MIRECA provides advices to the Belgian Government for the promotion of good governance as a growth factor in the field of natural mineral resources in Central Africa. Both initiatives have been initiated by the Belgian Foreign Affairs Ministry.

The TRACE project counts two major activity axes organised into several workpackages, namely 1- the analysis of financial and material flows and 2- the scientific and technical approaches of heterogenite traceability. The study of flows addresses the relationship between the official (industrial) and informal (small-scale) mining sectors. The reasons and the consequences of the illegal activities on heterogenite ore deposits are also analysed in the flow study. The scientific research follows a multidisciplinary approach including mineralogical, petrological, geochemical and spectrometric (Raman) analyses. That covers the main techniques that can reasonably be applied '*in fine*' in the Katanga Province in order to conduct a traceability-certification process.

In this presentation, we bring out the main results of the scientific measurements conducted on heterogenite samples from 18 mining sites throughout the Katanga Province. We put forward the relationship between the geochemical composition (microprobe, EDS) of the samples and its Raman spectroscopic response. In particular, we focus on the ability of Cu-rich heterogenite to be transformed at the μm -scale into a Co-spinel by the Raman laser heat flux. Besides the Cu-Co relationship, Ni-bearing heterogenite also presents specific Raman signature.

The TRACE project ("*TRACeability of hEterogenite*") follows an integrate scheme covering not only scientific studies, but also political and social aspects. The scientific approach is addressing the natural variability of ore bodies and the techniques that can be applied to conduct the analytical traceability, while the social and political sides are studied through the analysis of the financial and material flows. All these activities will help in the future the national and regional authorities of the Democratic Republic of Congo to implement the required tools for a sustainable management of the natural resources and especially heterogenite.