# Using Geochemistry to track the origin of gold concentrates in French Guiana

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Transparency and integrity of mineral supply chains have become a major stakes of international commerce with multiple issues: the fight against illegal exploitation and traffic, generating considerable shortfalls in the exporting countries, the struggle against money laundering and financing of terrorism, or, more generally, of armed groups, and, last but not least, the respect of environmental standards in exploitation. The illegal gold-panning and gold traffic have widespread in many countries, disturbing local economy and causing ecological disasters, such as in French Guiana. In this context, we propose to use a set of techniques to provide the geochemical traceability of gold concentrate (primary, eluvial and alluvial gold grains) in French Guiana. This case study is, in what concerns sample materials and mining conditions similar to the conditions expected for many artisanal mining areas in West Africa. Gold generally occurs in its native form, often alloyed with a narrow range of minor elements (e.g. silver and copper) in addition to a wide range of trace elements (antimony, platinum-group metals, etc) and micro-inclusions (telluride, pyrite, etc). The associated elements and the nature of micro-inclusions are characteristic for signature of a given gold deposit from which gold is extracted, and this fingerprint can be used for identifying deposits. The approach of this study consists using a set of innovative techniques to (i) characterize the morphology of gold grains, (ii) quantify the nature and the amount of solid micro-inclusions in gold crystals and (iii) determine the minor and trace elements composition for gold concentrates. The ability of this method to determine the origin of gold concentrates in French Guiana was examined by comparing several gold deposits from different districts in the French part of Guiana shield. The results showed that the shape of gold grains allows to distinguish primary and eluvial/alluvial gold and the origin of gold concentrates can be successfully determined using the combination of innovative techniques.