

Gold fertility assessment of alkaline intrusions in the Abitibi and Pontiac subprovinces of Québec


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Abstract

Recent work by Legault and Lalonde (2009) has demonstrated that it is possible, in the Abitibi and Pontiac subprovinces, to distinguish alkaline intrusions carrying gold (fertile intrusions) from those that lack mineralization (barren). The ability to identify these intrusions would allow us to better target areas for gold exploration. In this study, well-documented alkaline intrusions to the west of Rouyn-Noranda served as a control group for the characterization of fertile alkaline intrusions. Fertile intrusions generally display a moderate to intense degree of sericite, chlorite and/or carbonate alteration, which is rare in barren intrusions. The coexistence of pyroxene, amphibole and biotite in the same sample is only found in barren intrusions. Chemical analyses more provide an even better distinction between fertile and barren. Fertile intrusions tend to be more felsic and therefore have higher values of SiO₂ and Al₂O₃, and lower MgO and CaO. Fertile intrusions can also be differentiated on the basis of their trace element contents, with lower values of Co, Cr, Ni and Sc and higher Ga and Hf. The presence of normative quartz is characteristic of fertile intrusions, being generally absent in barren intrusions. The most useful diagrams for distinguishing these two types of intrusions are: MgO+CaO versus ½SiO₂+Al₂O₃; Sc versus Co; Cr versus Ga; and a normative quartz diagram. Within a fertile intrusion, the degree of alteration may be highly variable, particularly when the intrusion is large. The ratio K₂O/Na₂O, the IFRAIS and muscovite-paragonite indexes, and normative quartz can identify known mineralized zones and should therefore be able to target new areas for exploration. These conclusions were applied to the Cloutier–Mont-Brun and Chapais areas to identify potentially fertile intrusions. A compilation of assessment work confirmed that some of these intrusions are indeed auriferous.

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