Appendix A continued

Deposit or camp	Production: Tonnes ore (×10⁶) / Grade / Years	Production: Recovered (kg) Au	Production: Recovered (kg) Ag	Production: Other metals	Reserves: Tonnes ore (×10⁶) / Grade / Years	Reserves: Contained (kg) Au	Reserves: Contained (kg) Ag	Reserves: Total (kg) Au	Reserves: Total (kg) Ag	Deposit type / Age / Associated alkalic rocks / Remarks	References
d) Alabama zone					9.07 @ Au 0.1714 g/t Ag NA Cu 0.32% (1990)	1,555	NA	1,555	NA		
Stikine Copper (Galore Creek), B.C., Canada				Cu (PGE)	113.4 @ Au 0.480 g/t Ag 9.600 g/t Cu 1.06% (1989)	54,432	1,088,640	54,432	1,088,640	Porphyry and skarn Cu–Ag–Au–PGE; Jurassic (202.5 ± 7 Ma); diorite–syenite plutons; coeval alkalic volcanic rocks	Allen *et al.* (1976), Logan and Koyanagi (1989), Schroeter *et al.* (1989)
Sullivan, B.C., Canada	139.150 Au NA Ag NA (1900–1987)	175*	9,185,700	Pb, Zn, Cd, Sn	29.030 @ Au NA Ag 31.726 g/t Pb 4.6% Zn 6.9% (1989)	NA	921,006	>175	10,106,700	Exhalite clastic-hosted massive sulphide; Proterozoic (~1440 Ma); alkali basalts *Before 1980s only	Hamilton (1984), Höy (1989a,b), Schroeter *et al.* (1989)
Sulphurets Camp, B.C., Canada					39.392 (total a+b+c)	121,610	>900,000	121,610	>900,000	Epithermal–transitional Ag–Au veins and breccias; zoned downward to porphyry Cu–Ag–Au systems; Jurassic; syenodiorite plutons	Simpson (1983), Schroeter *et al.* (1989)
a) Brucejack Lake (West Zone, Shore, Gossan Hill)					1.290 @ Au 11.66 g/t Ag 691.542 g/t (1989)	15,041	892,089	15,041	892,089	Epithermal–transitional veins	
b) Snowfields				(Cu, Mo)	19.958 @ Au 2.846 g/t Ag NA (1989)	56,800	NA	56,800	NA	Porphyry	
c) Sulphurets Breccia				(Cu, Mo)	18.144 @ Au 2.743 g/t Ag NA (1989)	49,769	NA	49,769	NA	Porphyry (breccia)	

Precious-metal Deposits Related to Alkalic Igneous Rocks: Provisional Classification, Grade-Tonnage Data and Exploration Frontiers

F.E. Mutschler and T.C. Mooney

Petrophysics Crisis Center, Department of Geology, Eastern Washington University, Cheney, Washington 99004-2499 U.S.A.

Mutschler, F.E. and Mooney, T.C., 1993, Precious-metal deposits related to alkalic igneous rocks: Provisional classification, grade-tonnage data and exploration frontiers, in Kirkham, R.V., Sinclair, W.D., Thorpe, R.I. and Duke, J.M., eds., Mineral Deposit Modeling: Geological Association of Canada, Special Paper 40, p. 479-520.

Abstract

Although they are relatively rare, alkalic igneous rocks are both the host and source for a variety of precious-metal deposits. Alkalic rocks can be divided into the following associations: kimberlites; mafic-ultrapotassic rocks; syenite-pyroxenite-ijolite-carbonatite assemblages; lamprophyres; alkali basalts; Alaskan-type ultramafic-mafic complexes; ultramafic-felsic zoned complexes; mafic to felsic foid-bearing syenite-phonolite assemblages; shoshonites; peralkalic granite-syenite-gabbro associations; and bostonites. Important alkalic-rock-related precious-metal deposits include (1) orthomagmatic platinum group elements (PGE) ± gold in ultramafic-mafic (or felsic) complexes; (2) porphyry copper + silver + gold ± PGE associated with shoshonitic plutons or, less commonly, with pyroxenite-syenite-carbonatite complexes; porphyry "gold only" in felsic syenites; (3) epithermal gold only and gold + silver + base metals associated with a broad spectrum of alkalic rocks; (4) submarine exhalite Kuroko-type, Blackbird-type, Cyprus-type, volcanogenic manganese-type, and Rexspar-type base-metal deposits with gold and silver as by-products or co-products; (5) Olympic Dam iron + copper + uranium + gold ± rare-earth elements related to peralkalic granite-syenite-gabbro plutonic-volcanic suites; and (6) alkalic-rock-hosted gold in Archean shear zones.

The common association of epithermal gold deposits with coeval porphyry copper + silver + gold ± PGE deposits suggests that they represent immiscible fluids evolved in oxidized, CO_2-rich, alkaline-magma chambers. Prospecting guides for these porphyry and epithermal deposits include the presence of evolved (crustal-level fractionation) alkalic rocks; pervasive potassium-metasomatic, redox, carbonatic and sulphidization alteration; and low-level gold ± tellurium, etc. rock-geochemical anomalies.

Many alkalic rock provinces developed above mantle hot spots, but crustal structures controlled the final distribution of magmas and ore fluids. Hot-spot sites and tracks are excellent prospecting locales, as are back-arc and passive-margin rift settings and trans-tensional regimes associated with deeply penetrating strike-slip faults.

Résumé

Bien qu'elles soient relativement rares, les roches ignées alcalines sont à la fois les roches-hôtesses et les roches-sources d'une variété de gisements de métaux précieux. Les roches alcalines peuvent être subdivisées selon les associations suivantes: kimberlites; roches mafiques à ultrapotassiques; assemblages