GEOPHYSICAL MODEL OF LOW SULFIDE Au-QUARZTZ VEINS

COX AND SINGER MODEL No. 36a — Compiler - **W.D. Heran**

Geophysically similar models - no. 36b - Homestake Au

A. Geologic Setting

- Within greenstone belts, oceanic metasediments, regionally metamorphosed volcanic rocks, alpine gabbro and serpentine, graywacke, chert, shale and quartzite. Also late granitic batholiths.
- Fault and joint systems produced by regional compression.
- Gold hosted in massive quartz veins that generally post date regional metamorphism, and are persistent along regional high angle faults and joint sets. Disseminated ore occurs where veins cut granitic bodies.

B. Geologic Environment Definition

Remote sensing can be utilized to map regional lineaments, faults and joint systems, and lithologic boundaries (Longman, 1984; Clark and others, 1990; Crosta and Moore, 1989). Aeromagnetic data can delineate greenstone belts, as a high or a low depending if the belt is magnetic-rich or magnetic-deficient (Grant, 1984). Aeromagnetic surveys have been used to define regional faults and shears, and map the distribution of mafics, ultramafic and sediments within greenstone terrains (Lindeman, 1984; Boyd, 1984; Whitaker and others, 1987; Isles and others, 1989). Combined magnetic and gravity surveys have been used to map faults, shears, and other structures where basement rocks are covered (Whitaker and others, 1987; Suppel, and others, 1986). Gravity data and electrical soundings have been used to determine depths of greenstone sequences (DeBeer, 1982).

C. Deposit Definition

Aeromagnetic data can be useful at the deposit scale in identifying altered ultramafics, shown as flat areas or shallow magnetic lows, and delineating local structures, stratigraphy and intrusive (Pickette, 1982). Ground follow-up magnetic surveys would help further delineation of lithology and structure. Au-quartz veins hosted in mafic rocks are often characterized by linear magnetic lows related to magnetite destruction (Patterson and Hallof, 1991). Electromagnetic methods can be used to map faults or shear zones (conductive response if open), veins (resistive response), geologic contacts and alteration (Subrahmanyam and Jagannadham, 1984). Massive quartz veins can be mapped by detailed electrical resistivity or IP surveys as resistivity highs (Macnae, 1988; King, 1957; Murdoch, 1984). Radioelement surveys can be used to detect alteration (Costa and Byron, 1988). Remote sensing methods can detect minerals such as quartz, siderite, ankerite, sericite, and carbonates if they are present in great enough quantities (Knepper, 1989).

D. **Size and Shape**	**Shape**	**Average Size/Range**
Deposit	Thin tabular	$1.x10^4 m^3/3.8x10^2 m^3-3.5x10^5 m^3$
Alteration Haloe/s	Irregular	
Cap		

E. **Physical Properties** (Units)	**Deposit**	**Alteration**	**Host**
1. density	2.6[1] average	?	*
(gm/cc)	2.4-2.8	?	*
2. porosity	?		
3. susceptibility	100[1] average	?	*
(10^{-6} cgs)	10-8000	?	*
4. remanence	?		
5. resistivity	3000[1] average	?	*
(ohm-m)	1000-12000	?	*
6. chargeability	25[1]	?	*
(mv-sec/V)	10-80	?	*
7. seismic vel.	(4-6)	?	*
(Km/sec)			
8a. radiometric K	(low-high)	?	*
b. U	(low)	?	*
c. Th	(low)	?	*

F. Remote Sensing Characteristics

Remote sensing applications to exploration are based on identifying indirect indicators of potential host rocks including spectral, albedo, and textural characteristics. Potential host rocks composed of iron oxides and carbonate minerals can be uniquely identified with high spectral resolution instruments (imaging spectrometers) in the visible and near-infrared (Rowan and others, 1983; Clark and others, 1990). More importantly, imaging spectrometer data can be used to identify and map the distribution of specific iron oxide species (Taranik and others, 1991). Broad-band data in the visible and near-infrared, such as Landsat Thematic Mapper, are effective for separating carbonate- and iron oxide-bearing potential host rocks from other lithologies on regional and local scales (Knepper, 1989). Enhanced Landsat data have been used to define lineaments, fracture patterns and major structures (Longman, 1984). Airborne MSS data can delineate faults, joints and stratigraphic units (Honey and Daniels, 1985).

Thermal IR - Chlorite may be detectable in host rocks; siderite, ankerite, sericite, and carbonates at the deposit scale.

G. Comments

Geophysical data in the literature are very sparse for this deposit type, at the deposit scale. Regional data are fairly abundant, within greenstone terrains.

H. References

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