

## DESCRIPTIVE MODEL OF KIPUSHI Cu-Pb-Zn

By Dennis P. Cox and Lawrence R. Bernstein

DESCRIPTION Massive base-metal sulfides and As-sulfosalts in dolomite breccias characterized by minor Co, Ge, Ga, U, and V.

### GEOLOGICAL ENVIRONMENT

Rock Types Dolomite, shale. No rocks of unequivocal igneous origin are related to ore formation. [The pseudoaplite at Tsumeb is herein assumed to be a metasedimentary rock following H. D. LeRoex (1955, unpublished report).]

Textures Fine-grained massive and carbonaceous, laminated, stromatolitic dolomites.

Age Range Unknown; host rocks are Proterozoic in Africa, Devonian in Alaska, Pennsylvanian in Utah.

Depositional Environment High fluid flow along tabular or pipe-like fault- or karst (?) breccia zones.

Tectonic Setting(s) Continental platform or shelf terrane with continental or passive margin rifting. Ore formation at Tsumeb and Ruby Creek predates folding.

Associated Deposit Types Sedimentary copper, U-veins, barite veins. Sedimentary exhalative Pb-Zn may be a lateral facies.

### DEPOSIT DESCRIPTION

Mineralogy Ruby Creek: pyrite, bornite, chalcocite, chalcopyrite, carrollite, sphalerite, tennantite. Tsumeb: galena, sphalerite, bornite, tennantite, enargite. Kipushi: sphalerite, bornite, chalcopyrite, carrollite, chalcocite, tennantite, pyrite. Less abundant minerals in these deposits are linnaeite, Co-pyrite, germanite, renierite, gallite, tungstenite, molybdenite, and native Bi. Bituminous matter in vugs. At Apex mine, marcasite.

Texture/Structure Massive replacement, breccia filling, or stockwork. Replacement textures of pyrite after marcasite at Ruby Creek and Apex.

Alteration Dolomitization, sideritization, and silicification may be related to mineralization. Early pyrite or arsenopyrite as breccia filling or dissemination.

Ore Controls Abundant diagenetic pyrite or other source of S acts as precipitant of base metals in zones of high porosity and fluid flow. Bitumens indicate reducing environment at site of ore deposition.

Weathering Malachite-azurite, black Co-oxide, or pink Co-arsenate. Oxidation at Tsumeb has produced large crystals of many rare minerals. Oxidized Ge-Ga ore at Apex consists of iron oxides and jarosite; Ge and Ga minerals are not observed.

Geochemical and Geophysical Signature Cu, Zn, Pb, As, Co, Ag, Ge, Ga, Mo, W, Sn, Bi, U and V. Metal ratios: high Cu/Fe and locally high Cu/S in interior zones; high Co/Ni, As/Sb and Ag/Au. May be weakly radioactive.

### EXAMPLES

Ruby Creek, ASAK	(Runnels, 1969)
Tsumeb, NAMB	(Sohnge, 1961); Wilson (1977)
Kipushi, ZIRE	(Intiomale and Oosterbosch, 1974)
Apex Mine, USUT	(Bernstein, 1986)

# Mineral Deposit Models

DENNIS P. COX and DONALD A. SINGER, Editors

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