

SHORTER COMMUNICATIONS

FRAMBOIDAL PYRITE AND CONCENTRIC TEXTURES IN ORES OF THE TILT COVE MINE, NORTHEASTERN NEWFOUNDLAND

K. KANEHIRA AND D. BACHINSKI¹

Chiba University, Chiba, Japan and Geological Survey of Canada, Ottawa

Introduction

Copper deposits associated with eugeosynclinal volcanic rocks in the Notre Dame Bay area of northeastern Newfoundland are being studied under the auspices of the National Advisory Committee on Research in the Geological Sciences. Several textures displayed by sulphide minerals in ores from the Tilt Cove mine were recognized as noteworthy during a brief examination of the deposits by the writers in 1964. This note is descriptive and is concerned solely with these textures.

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General geology of the Tilt Cove Area

The geology and ore deposits of the area have been described by Snelgrove (1931), Douglas *et al.* (1940), Baird (1951) and Neale (1957). The sulphide deposits occur in the Snooks Arm Group of Ordovician age; these rocks include pillowed and massive lavas, tuff breccias and tuffs all of mafic to intermediate composition interbedded with minor argillite and chert. Serpentinite intrudes the Snooks Arm Group and the whole is unconformably overlain by the Cape St. John Group of probable Silurian age (Neale, in preparation). All these rocks are intruded by Devonian quartz porphyry dykes.

Donoghue *et al.* (1959) briefly described the occurrence of several lens-shaped massive sulphide orebodies and a stockwork-type deposit in the area. Chloritized and sheared andesitic pillow lavas and tuff breccia are hosts to the deposits. Pyrite and chalcopyrite are the predominant ore minerals; magnetite, pyrrhotite, sphalerite, native silver, electrum, specular hematite, limonite, and native copper have been recognized. Nickel sulphides and arsenides, of restricted occurrence, have been described by Papezik (1964). Wall rocks in contact with sulphide orebodies are altered and in places consist of monomineralic aggregates of

¹Present address: Yale University, New Haven, Conn.

chlorite; considerable hematite is present locally and calcite veining is common in the ores and wall rocks.

Massive sulphide deposits

Polished sections were made of samples taken largely from the 30 stope, 1600 level of the East mine supplemented by specimens from the ore pile. For the most part the ores are massive, fine-grained aggregates of pyrite and chalcopyrite with subordinate amounts of sphalerite, hematite and magnetite. Pyrrhotite and ilmenite are present in minor amounts. Brecciation and compositional banding are occasionally noted in hand specimens. Coarse-grained hematite occurs as patches and fracture fillings in the massive sulphide ores. Gangue constituents include chlorite, quartz, muscovite and carbonates.

Framboidal pyrite and concentric textures

Pyrite occurs as euhedral grains, pelletal or framboidal microforms and displays mesh-like textures and concentric growths.

Pyrite spheroids or pellets 12μ in average diameter were found in five polished sections (Fig. 2a). Grain size distribution of the spheroids based on measurements on polished surfaces is shown in Fig. 1. Individual pellets are composed of pyrite grains 1μ or less in diameter (Fig. 2b)

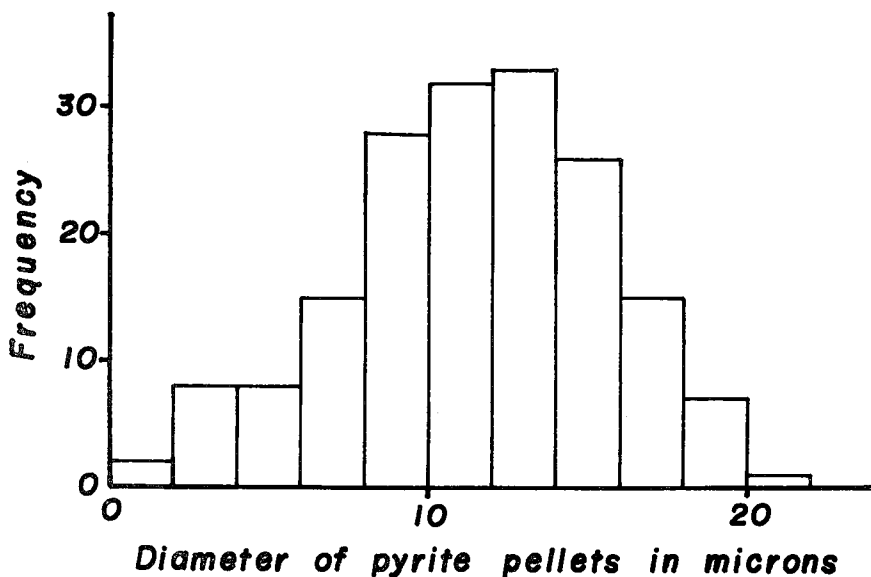


FIG. 1. Frequency diagram showing the apparent grain size distribution of pyrite pellets.

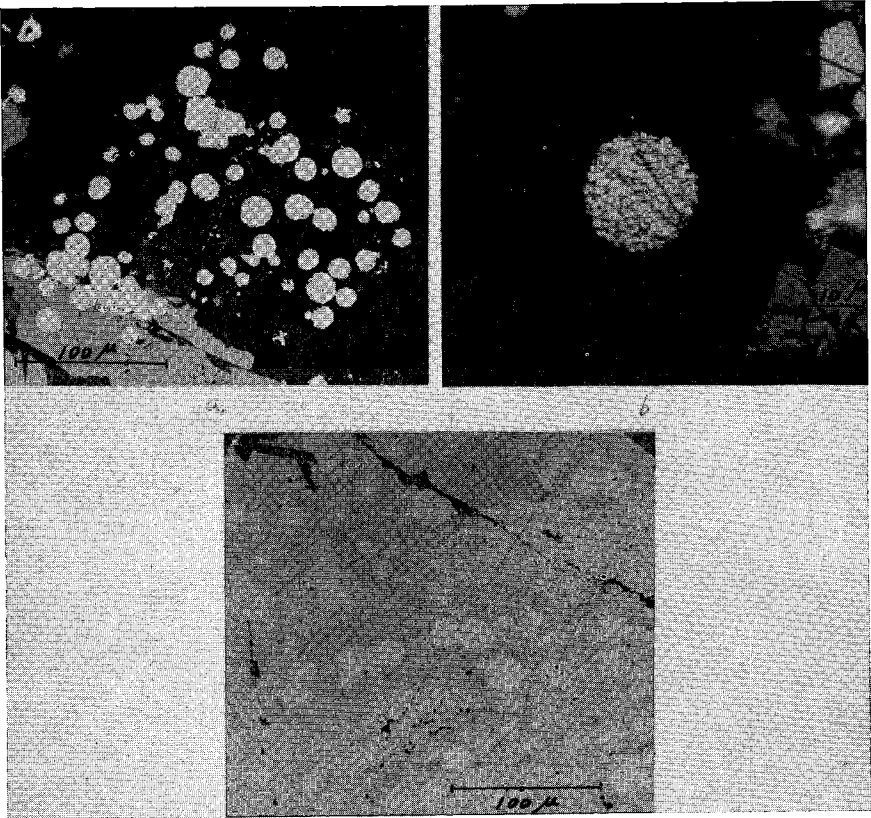


FIG. 2. Photomicrographs of pyrite pellets. a. Pyrite pellets (white) in chlorite matrix (black) and hematite (grey). Oil. WHK-64-21-1. b. Framboidal texture of pyrite pellets. Etched by 1:1 HNO_3 , Oil. Same specimen as Fig. 2a. c. Pelletal pyrite (white) embedded in fine-grained pyrite-chalcopyrite aggregate. Oil. Same specimen as Figs. 2a and 2b.

giving rise to a framboidal texture. The spheroids tend to occur as clusters in the silicate matrix. In some cases they are cemented by fine-grained aggregates of pyrite and chalcopyrite (Fig. 2c).

Concentric intergrowths of pyrite and chalcopyrite are common; this texture is typified by Fig. 3a in which layers of acicular pyrite crystals are interlayered with thin layers of chalcopyrite. The intergrowths display a fan-shape and usually are about 0.1 mm in diameter. Concentric growths of fine-grained pyrite are also found in a sphalerite matrix (Fig. 3b). Concentric texture was observed in one polished section of brecciated sulphide ore: finely interlayered pyrite and chalcopyrite form growths 0.1 to 0.3 mm in diameter. These concentric intergrowths are brecciated in similar fashion to other sulphide aggregates present (Fig. 3c).

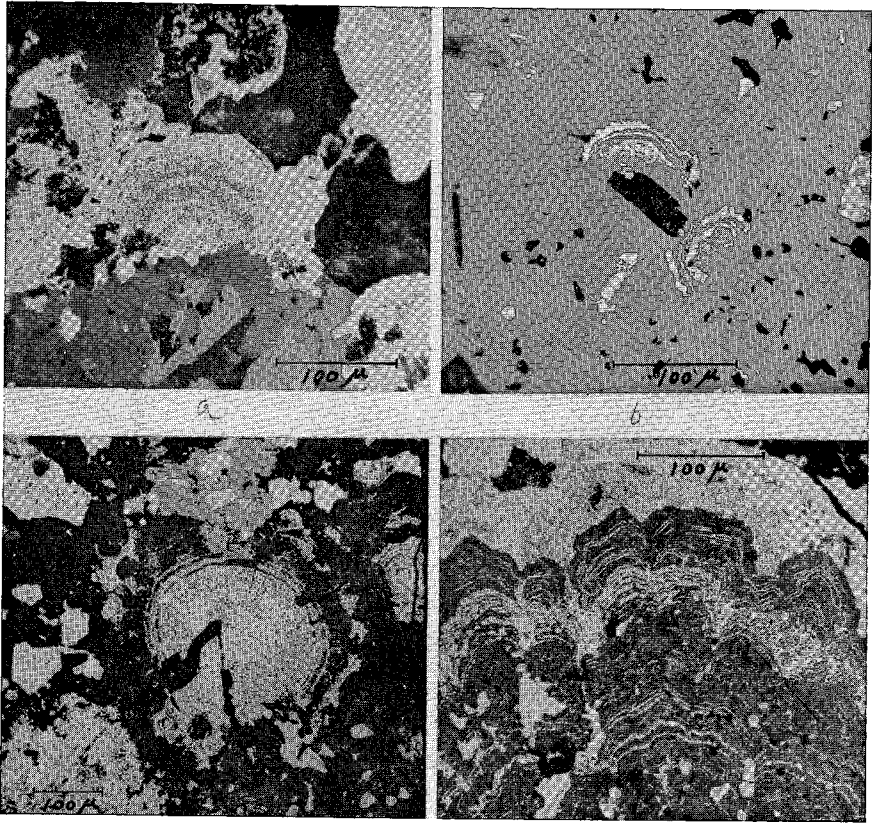


FIG. 3. Photomicrographs of concentric sulphides. a. Concentric texture of acicular pyrite and chalcopyrite layers. The intergrowth is associated with silicates (black), sphalerite (dark grey), hematite (grey) and euhedral pyrite (white). Oil. WHK-64-21-2b. b. Concentric texture of pyrite (white) in sphalerite base (grey). Several grains of euhedral magnetite (light grey) embedded in sphalerite. Oil. WHK-64-21-2a. c. Concentric texture shown by pyrite and chalcopyrite; these aggregates are fractured. The matrix consists of chlorite (black), hematite (grey) and chalcopyrite (white). Oil. WHB-TC1002-26S. d. Concentric texture of sphalerite (black) and chalcopyrite (light grey). Pyrite (white to light grey) occurs in the outermost zone of the intergrowth and along cracks within the intergrowth. Oil. Same specimen as Fig. 3c.

Chalcopyrite may display concentric banding with sphalerite (Fig. 3d); the outer zone of the intergrowth is angular. This texture appears to be a rhythmic overgrowth of sphalerite and chalcopyrite.

These textures warrant brief comment. All of them suggest deposition of sulphides under near-surface conditions. Regardless of their exact mode of formation, the mere fact that such fabrics are preserved is significant. It is well known that rapid reactions in the solid state are

characteristic of sulphides (e.g., B. J. Skinner *in* Roedder, 1965). Preservation of the above fabrics indicates little post-depositional change occurred. The ores of the Tilt Cove area have therefore suffered only mild metamorphism.

Studies (Bachinski) are continuing on the Tilt Cove and related deposits in the area. An attempt is being made to reconstruct the volcanicsedimentary sequences and to place constraints on the time of mineralization. Further consideration of the textures described in this note is thus being deferred until completion of the project.

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SOME PROPERTIES OF RAMMELSBERGITE AND PARARAMMELSBERGITE

DENNIS RADCLIFFE

Department of Geology, University of Georgia, Athens, Ga. 30601 USA

A number of nickel diarsenide specimens were examined in the course of a larger investigation of transition metal arsenide minerals (Radcliffe 1966) using electron microprobe, density, and x-ray diffraction techniques.

Rammelsbergite has the space group *Pnmm* (58) (Peacock & Dadson, 1949). This was confirmed by Kaiman (1946) who showed that it has the marcasite structure (*C18* type).

Pararammelsbergite has the space group *Pbca* (61) determined by Yund (1961) for synthetic material and by Berry & Thompson (1962) for