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A dendritic-type arrangement of pyrite from the Kangiara deposit, SE Australia

THE Kangiara deposit in SE Australia (fig. 1) is a Cu–Pb–Zn deposit of approximately 50 000 tonnes which occurs in acid volcanic rocks of Silurian age. It closely resembles the deposits of Woodlawn (Malone *et al.*, 1975) and Captains Flat (Davis, 1975) with respect to its mineralogy, ore textures and sulphur isotope composition.

Pyrite is one of the main sulphide minerals present in the Kangiara mineralization, and typically occurs as euhedral grains, both isolated and in clusters, set in sphalerite, galena, chalcopyrite or quartz. However, within pyrite-rich portions of the mineralization a dendritic-type arrangement of pyrite grains (fig. 2) also occurs. This unusual arrangement of pyrite grains varies in width from 0·05 mm to 0·5 mm (averaging 0·1 mm), and is up to 5 mm long. The dendritic structures are only seen in certain planes in the ore. Etching the dendritic-type arrangement with HF showed that central portions of the pyrite grains are more susceptible to the acid. These etched central portions are normally aligned with one another, and form distinct orientations in the mineralized samples, independent of the orientation of the actual pyrite grains. In addition to the isolated, clusters and dendritic forms of pyrite, radiating patterns and delicate networks are present, and may be variations of the dendritic pyrite form.

Electron microprobe analyses of both the isolated euhedral pyrite and the dendritic pyrite forms (Table I) gave approximately stoichiometric values for pyrite. The minor differences which do occur may be due to instrumental variations, the presence of submicroscopic inclusions, or slight variations in elemental substitution of iron in the pyrite

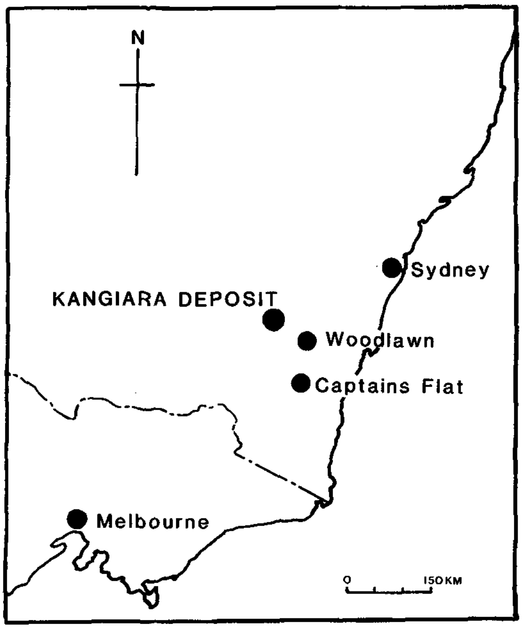

FIG. 1. Location of the Kangiara deposit, south-eastern Australia.

TABLE I. *Electron microprobe analyses of pyrite from the Kangiara deposit, SE Australia*

	1		2	
	wt.%			
	x̄	S.D.	x̄	S.D.
S	53.01	0.47	53.46	0.50
Fe	45.90	0.36	45.54	0.43
Cu	n.d.		0.21	0.30
Ni	0.03	0.07	n.d.	
Co	n.d.		n.d.	
Total	98.94		99.21	
	at.%			
S	66.78	0.18	67.07	0.22
Fe	33.20	0.19	32.80	0.32
Cu	n.d.		0.13	0.19
Ni	0.02	0.05	n.d.	
Co	n.d.		n.d.	
Fe:S	1:2.01		1:2.04	

1. Dendritic form of pyrite; average of four analyses.
2. Euhedral form of pyrite; average of eight analyses.

n.d. not detected; x̄ average; S.D. standard deviation. Analyst. F. Ivor Roberts.

structure. No chemical zonation of the pyrite grains with respect to major elements was observed and in all cases the variations of measurements was not more than 3% from the average values of Fe and S for the individual grains. Variations of acid susceptibility between the outer and central portions of the pyrite grains may be due to zoning of trace elements during crystal growth; however, the evidence for this is lacking. As can be seen from Table II the sulphur isotope values for the euhedral and dendritic pyrite forms are similar.

A search of the literature failed to find any previous descriptions of this texture for pyrite. However, dendrites composed of manganese oxide are a common weathering phenomenon found throughout the world; but unlike manganese dendrites, this pyrite dendritic arrangement appears to be a primary texture, having formed at the same time as the enclosing ore.

A suggestion for the origin of this texture is that the etched central portions of the pyrite grains originally formed along minute fractures in the partly consolidated or consolidating ore. The orientation was possibly governed by stress directions of the orebody during its formation or consolidation. A second period of pyrite formation then took place whereby the original pyrite acted as a nucleus, and the resulting growth gave rise to the present dendritic texture.

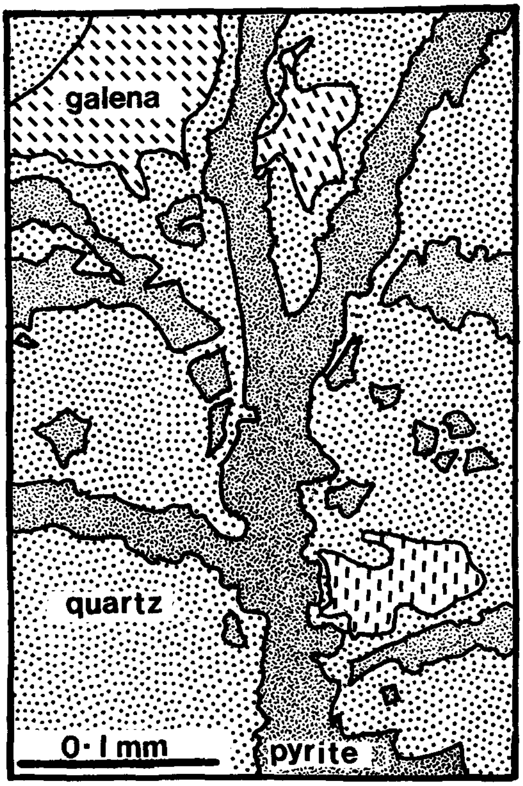

FIG. 2. Sketch of the dendritic-type arrangement of pyrite.

TABLE II. *Sulphur isotope values for pyrite from the Kangiara deposit, SE Australia*

Sample no. (CSIRO)	$\delta^{34}S$	Form
51123	+11.0	Euhedral
51124	+11.4	Dendritic

Analyst. J. Smith, CSIRO Division of Mineralogy, Sydney.

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Mineralization at Le Pulec, Jersey, Channel Islands; No. 1 Lode

THE No. 1 Lode is the westernmost and most extensive of three lead-zinc veins cutting Brioverian sediments at Le Pulec. It was described by Williams (1871) as being between 1.5 and 1.8 m in width and 183 m in length, with a trend of 340°, and the galena was reported to have a high silver content. Since the investigation of the No. 3 Lode (Ixer and Stanley, 1980) it has been possible to examine several specimens, collected from the recently rediscovered No. 1 Lode.

As with the No. 3 Lode, two main mineralization episodes can be distinguished. The earlier of these is a pyrite-marcasite-arsenopyrite episode associated with minor quantities of galena, sphalerite, and chalcopyrite, occurring in thin veins in the metasediments. Sphalerite, galena, tetrahedrite, pyrite, and bournonite occur in the later episode with minor chalcopyrite and native antimony associated with a quartz gangue. The primary opaque minerals have been extensively altered to secondary sulphides and carbonates.

The mineralogy of the No. 1 Lode is based on a study of hand specimens and polished sections, and is described in its suggested paragenetic sequence.

Detrital minerals within the metasediments

The Brioverian sediments contain 60-75 μm euhedral zoned zircons, some of which have small (< 1 μm chalcopyrite inclusions and relict skeletal laths of iron titanium oxide minerals.

Mineralization within the Brioverian sediments

Anatase is common within the sediments as 2-10 μm anhedral grains associated with silicates or as 10×2 μm laths, parallel to the basal cleavage of the altered phyllosilicates, particularly muscovite. Anatase is also found with hematite laths (20×2 μm) included in early pyrite grains. A coarse-grained (600×20 μm) generation of anatase or rutile is included in and replaced by a coarse-grained pyrite.

Minor quantities of *pyrite* are present along basal cleavages of the phyllosilicates or form small (20-70 μm) subhedral to euhedral grains in the thin quartz veins which cut the sediments. However, most of the pyrite occurs as large fractured grains, subsequently recemented by quartz, or by minor amounts of galena. This pyrite encloses hematite laths, anatase, rutile, minute inclusions (< 2 μm) of pyrrhotine and marcasite (2-5 μm), galena (< 5-30 μm), and sphalerite (< 10-20 μm). It is commonly surrounded by a spongy pyrite rim (< 60 μm) and by arsenopyrite. Pyrite also occurs intergrown with *marcasite*, forming shattered tabular aggregates that are cemented and replaced by galena. The marcasite displays twinning and anisotropy boundaries perpendicular to the length of the tabular aggregate.

Arsenopyrite is present mostly as rhombs (20-80 μm) or lath-shaped grains (< 400×20 μm) that surround the coarse-grained pyrite. The rhombs are fractured and cemented by galena. Arseno-