Canadian Mineralogist
Vol. 16, pp. 375-377 (1978)

A DOMINANT DIPLOID ON A PYRITE CRYSTAL FROM GREECE

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ABSTRACT

A pyrite crystal from the Kassandra Peninsula, Greece is described in detail. The dominant form is the diploid {321}, whose faces are shown to consist entirely of minute faces of the cube, octahedron and pyritohedron {210} that intersect to form minute growth hillocks on the diploidal surfaces. No planar diploid faces could be detected even with scanning electron microscope photographs with magnifications up to 1800 diameters.

SOMMAIRE

Sur un cristal de pyrite provenant de la péninsule de Cassandre (Grèce), la forme dominante est un diploïde {321}, dont les faces sont constituées entièrement de faces du cube, de l'octaèdre et du pyritoèdre {210} qui forment, par leurs intersections, d'infimes monticules de croissance sur les surfaces diploïdales. Aucune face diploïdale plane n'a pu être décelée, même par microscopie électronique à balayage avec grossissement allant jusqu'à 1800 diamètres.

(Traduit par la Rédaction)

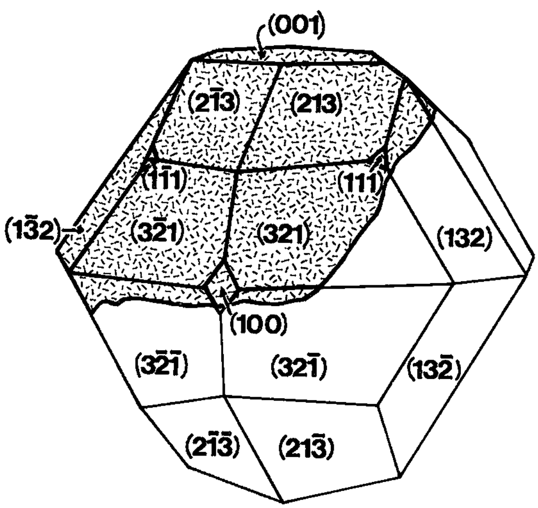

FIG. 1. A sketch of the crystal superimposed on a positive diploid {321}. Fragment #1 (Figs: 5 and 6) from the edge $(1\bar{3}\bar{2})/(\bar{1}\bar{3}\bar{2})$ is located near the lower left corner of the crystal. Fragment #2 (Fig. 4) from the edge $(3\bar{2}\bar{1})/(1\bar{3}\bar{2})$ is located just behind the lower left corner of the crystal.

INTRODUCTION

The Royal Ontario Museum, in assembling pyrite crystals for an exhibit (Gait 1978) purchased an unusual pyrite crystal from the Kassandra Peninsula, Macedonia region, Greece (ROM M35071). Because such examples are rarely seen, and constitute only about 6 percent of the 691 pyrite crystals illustrated in Goldschmidt (1920), it was thought worthwhile to describe this crystal in detail using the scanning electron microscope.

THE CRYSTAL

The crystal measures 6 x 6 x 3 cm and is illustrated in Figure 1 where it is superimposed on a complete positive diploid {321}. Figure 2 shows the crystals viewed almost normal to $(1\bar{1}1)$. The dominant faces represent the diploid

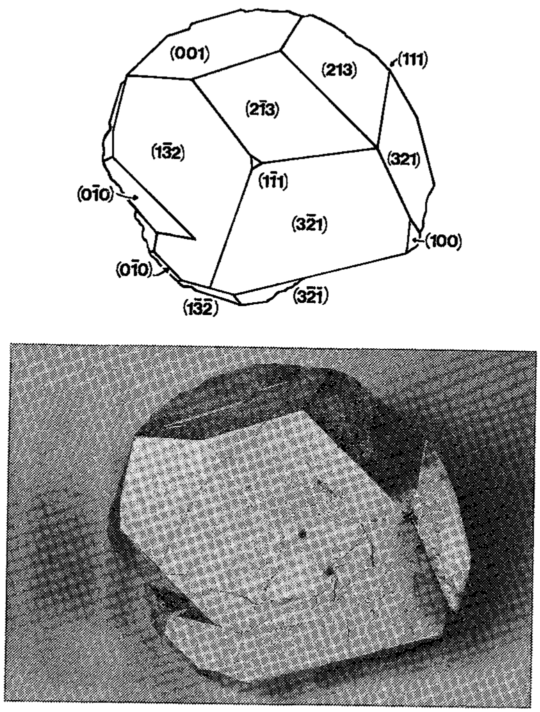

FIG. 2. A sketch and photograph of the diploid viewed normal to $(1\bar{1}1)$.

TABLE 1. TABLE OF ANGLES

Angle	Measured*	D. & F.
$(321) \wedge (3\bar{2}1)$	64½°	64° 37¼'
$(213) \wedge (2\bar{1}3)$	30¼°	31° 0¼'
$(321) \wedge (213)$	38¼°	38° 12¼'
$(213) \wedge (001)$	37¼°	36° 42 '
$(213) \wedge (111)$	20 - 25°	22° 12¼'
$(100) \wedge (2\bar{1}0)$	25°20'†	26° 34 '

D. & F.: Dana & Ford (1932); * measured with a contact goniometer; † measured by reflectance.

{321} modified by cube, minor octahedral and extremely small pyritohedral faces. The latter can be seen clearly only with the binocular microscope. No other forms were observed. The interfacial angles are given in Table 1.

The cube faces are brilliant and mirror-like, the tiny octahedral faces are less brilliant and have striations parallel to the intersections between the cube and the octahedron. The diploid faces are frosted in appearance due to the presence of minute growth hillocks.

The nature of the hillocks first became apparent when simultaneous reflections were obtained from the octahedral face $(1\bar{1}1)$ and the three apparent diploid faces surrounding it $(3\bar{2}1)$, $(2\bar{1}3)$ and $(1\bar{3}2)$ (Fig. 2); similar simultaneous reflections were observed from the cube (100) and the 6 apparent diploid faces (321), $(3\bar{2}1)$, $(32\bar{1})$ $(3\bar{2}\bar{1})$, $(2\bar{1}3)$ and (213) (Fig. 1); the pairs of apparent diploid faces adjacent to the minute pyritohedral faces also gave simultaneous reflections; (321) and $(32\bar{1})$ with (210), and $(3\bar{2}1)$ and $(3\bar{2}\bar{1})$ with $(2\bar{1}0)$. These various sets of simultaneous reflections strongly suggested that the growth hillocks consisted of minute faces attributable to the cube, octahedron and pyritohedron.

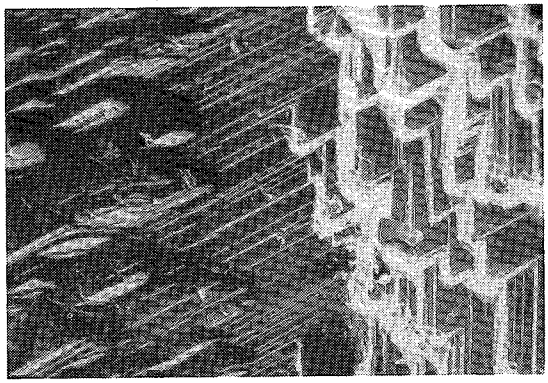

FIG. 4. The edge between $(3\bar{2}\bar{1})$ right and $(1\bar{3}\bar{2})$ left, dividing the photograph vertically, defined by a strong set of striations (SEM, ×150.)

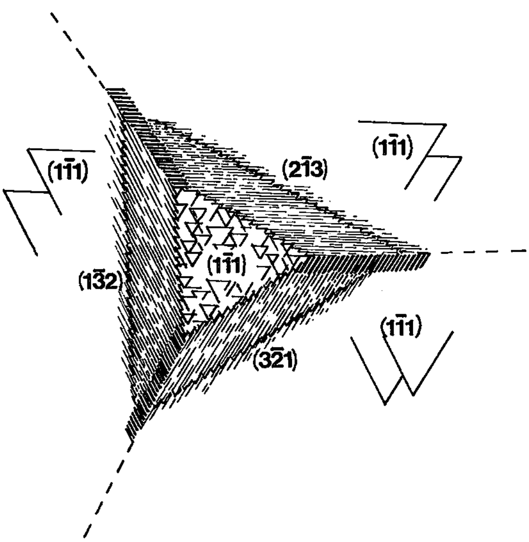

FIG. 3. A sketch of the striations on the faces $(1\bar{1}1)$, $(3\bar{2}1)$, $(2\bar{1}3)$ and $(1\bar{3}2)$ (approx. ×80).

Figure 3 is a sketch of the striations on $(1\bar{1}1)$ and the surrounding diploid faces at about 80x magnification. The diploid/diploid edges and the octahedron/diploid edges are composed of intersecting sets of striations, none of which are parallel to these edges. Another set of striations is parallel to the octahedron/diploid edges. These may be seen in Figure 2, but are exaggerated in Figure 3 where they can be seen to be composed of intersecting sets of striations parallel to the cube/octahedron edges.

Small fragments were chipped from the crystal for study using the SEM. The locations on the crystal from which the fragments were taken are described in the caption to Figure 1.

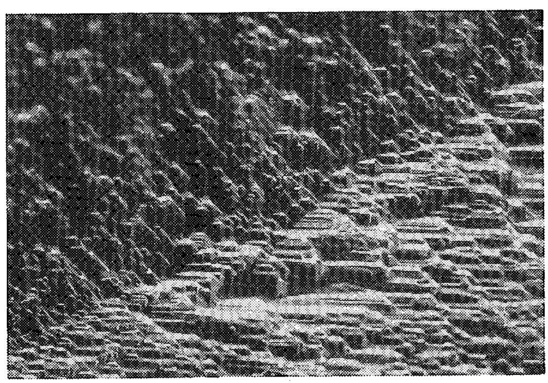

FIG. 5. The edge between $(1\bar{3}\bar{2})$ lower right and $(\bar{1}\bar{3}\bar{2})$ upper left. (SEM, × 330).

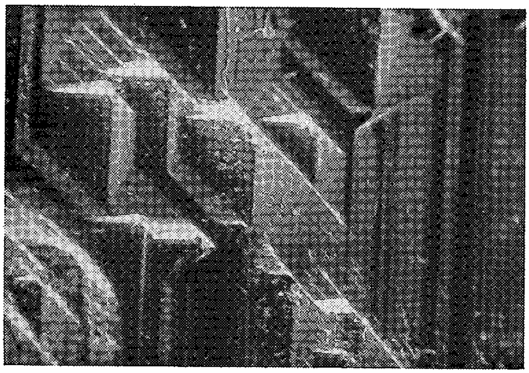

FIG. 6. The texture on $(\bar{1}\bar{3}\bar{2})$ (SEM), × 1800).

Fragment 2 consists of two diploid faces, $(3\bar{2}\bar{1})$ and $(1\bar{3}\bar{2})$, related to each other by three-fold symmetry; Figure 4 (SEM, ×150) shows this diploid/diploid edge, defined by a set of prominent striations in a band dividing the photograph vertically. All the striations in Figure 4 are parallel to intersections between the cube and octahedral faces.

Fragment 1 consists of two diploid faces, $(1\bar{3}\bar{2})$ and $(\bar{1}\bar{3}\bar{2})$, related to each other by mirror symmetry. In Figure 5 (SEM, ×330) the edge between these faces runs diagonally from upper right to lower left. Figure 6, (SEM, × 1800) taken on $(\bar{1}\bar{3}\bar{2})$, shows a detailed view of the intersecting faces of the cube, octahedron and pyritohedron of which the apparent diploid faces are composed. No diploid surfaces were detected.

CONCLUSION

Paradoxically, no actual diploid surfaces exist on this crystal, even though it is the finest example of the diploid form on pyrite in the ROM collections. The diploid surface is composed entirely of hillocks formed by the intersecting faces of the cube, octahedron and pyritohedron. This conclusion is supported by the reflectance properties of the crystal and the SEM photographs.

ACKNOWLEDGEMENTS

The author would like to thank Drs. J.A. Mandarino, Jack Satterly and F. J. Wicks for their helpful comments and suggestions. Mr. Julian Mulock of the ROM did the drawings and Bill Robertson of the ROM took the photograph for Figure 2. Eric Lin of the Zoology Department at the University of Toronto prepared the SEM photographs.

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Received March 1978; revised manuscript accepted May 1978.