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Sulphide Metamorphism and Deformation—introduction

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THE seven papers published in the following thematic set derive from a session on the theme of 'Sulphide Metamorphism and Deformation' organised by the Metamorphic Studies Group at the 1991 Winter Meeting of the Mineralogical Society on 'Industrial and Environmental Mineralogy' (16–18 December, 1991, Cardiff).

Two keynote addresses were given. In the main plenary session J. R. Craig and F. M. Vokes gave an overview of the metamorphism of pyrite and pyritic ore. The resultant paper emphasises how the refractory nature of pyrite and its tendency to form porphyroblasts often enables it to preserve evidence of pre-, prograde, and retrograde metamorphic and deformation events, making it, like garnet in silicate rocks, a potentially useful mineral for deciphering metamorphic history. They also stress the effects of the metamorphic sulphur budget on pyrite: pyrrhotite ratios during a heating and cooling cycle. In the Metamorphic Studies Group session, F. M. Vokes and J. R. Craig described post-recrystallisation remobilisation phenomana in cataclastically deformed pyrite metablasts from the Gressli deposit, Norway. In their paper, carefully observed textures illustrate the roles of solid-phase and fluid-phase mobilisation of sulphide and silicate components in metamorphosed ores, showing a replacement sequence of chalcopyrite-sphalerite-quartz; the sulphides most likely being derived from within the ore body whereas the quartz most probably came from without.

The remaining contributions fall into two main categories: experimental case studies and natural field case studies.

In the first category, H. Siemes, D. Zilles, S. F. Cox, P. Merz, W. Schäfer, G. Will, H.Schaeben and K. Kunze investigate the preferred orientation of experimentally deformed pyrite (24–30% shortening) using the neutron diffraction texture goniometry method, and show how this method can assess the development of very weak crystal textures that the more traditional method of X-ray goniometry fails to resolve. E. M. Jansen, H. Siemes, P. Merz, W. Schäfer, G. Will, and M. Dahms compare and contrast results of neutron diffraction texture goniometry and X-ray goniometry on experimentally deformed chalcopyrite ores from Mt. Isa, again showing that the former method reveals details of the chalcopyrite texture not shown by the X-ray goniometry method. A third contribution in this category by C. Hennig-Michaeli, J.-J. Couderc and M. V. Paterson on reaction products in chalcopyrite single crystals experimentally deformed at high temperature was not submitted for publication.

In the second category, D. Brown and K. McClay outline the deformation textures found in pyrites from the Vangorda deposit, Yukon, Canada, drawing attention to the effects of strain rate and fluid composition on the deformation mechanisms are in pyrite at mid-greenschist facies conditions. N. J. Cook, C. Halls and A. P. Boyle describe texture development in the classic strata-bound ores from Sulitjelma, Norway, relating them to the well-constrained tectono-metamorphic history of the silicate host rocks. R. Duckworth and D. Rickard discuss fine grained, banded textures from the Renström deposit of Sweden in terms of pressure solution and grain boundary sliding processes leading to the development of sulphide mylonites. In a presentation not submitted for publication, I. R. Plimer gave a wide-ranging exposition on the metamorphism

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and deformation of the Broken Hill deposit in Australia, emphasising the need to consider the whole geology when attempting to understand the metamorphic and deformation history of a sulphide ore deposit. R. A. Scott described evidence for the preservation of primary pyrite textures from lower amphibolite facies stratabound sulphide mineralisation in the Dalradian of Scotland, the recognition of primary mineral inclusions in pyrite providing evidence for the ore forming conditions and suggesting that genetic environment interpretation on the basis of Co/Ni ratios in pyrite should be treated with caution.

Organisation of this session benefited from the excellent efforts of Prof. David Rickard, the convenor of the 1991 Winter Meeting, and his colleagues at University College Cardiff, who are all thanked for their assistance. Thanks are also due to Dr. Andrew Clark (Principal Editor of the Mineralogical Magazine), Mr. Kevin Murphy (Editorial Assistant), and all the referees who gave freely of their time to help get this thematic set together.

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