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SOCIETY OF MINING ENGINEERS of AIME

345 EAST 47TH STREET, NEW YORK, N. Y. 10017

PREPRINT NUMBER

72-I-57



MINERALIZATION AND ALTERATION AT THE PIMA MINE
A COMPLEX PORPHYRY COPPER DEPOSIT
PIMA COUNTY, ARIZONA

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This paper is to be presented at the AIME Annual Meeting -
San Francisco, California - February 20-24, 1972.

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ABSTRACT

The Pima mine, 39,000 ton per day copper mine, is located 17 miles south of Tucson, Arizona.

The mine is in a sequence of Paleozoic and Mesozoic sediments striking east-northeast and dipping southeasterly intruded by a Tertiary quartz monzonite porphyry. The Paleozoic Permian(?) dolomites, limestones, and sandstones have been altered to calc-silicate skarn, marble and quartzite. The overlying Mesozoic Triassic(?) clastic sediments have undergone some recrystallization and hydrothermal alteration. The clastic metasediments are divided into three distinct lithologic units: lithic arenite, arkose, and interbedded and overlying black argillite. Three types of hydrothermal alteration in the clastic rocks are propylitic alteration (epidote, chlorite and quartz, with or without sericite), quartz-sericite alteration, and potassic alteration (K-feldspar and quartz, with or without sericite and chlorite). The porphyry has undergone potassic alteration.

Dominant structures are an east-west post mineral fault in the western part of the pit, and strong low angle faulting and shearing which truncates the ore body at depth. Two joint sets, one parallel to bedding and the other at right angles to bedding are prominent in the mine. Faulting is in two dominant directions, one striking northwest, dipping northeast and the other striking northeast, dipping northwest.

Mineralization is predominantly disseminated pyrite and chalcopyrite, and molybdenite-quartz veinlets. There are less important amounts of magnetite, hematite, sphalerite, galena, tennantite and bornite. Mineralization is believed to be both structurally and chemically controlled.

ACKNOWLEDGMENTS

The author wishes to express appreciation to John M. Guilbert for his advice and reviewing of the manuscript.

Appreciation is extended to the Pima Mining Company and especially to Mr. A. A. Friedman, now retired Vice-President and General Manager; Mr. M. W. Hood, Chief Mining Engineer, and Mr. D. Williamson, Geologist, for their cooperation and suggestions during the study at Pima.

Special thanks are due to Mr. H. G. Peacock, Vice-President of Utah International Inc., for his support and suggestions during the study of the Pima deposit.

INTRODUCTION

The deposits at Pima involve the intrusion of a quartz monzonite porphyry into sediments of Paleozoic and Mesozoic age, resulting in high grade mineralization of the Paleozoic rocks and disseminated ore in the younger Mesozoic sediments and quartz monzonite porphyry. Both types of deposits will be discussed, with greater emphasis given to the disseminated ores.

Geologic mapping of the exposed pit walls was conducted from June through mid-September of 1970. The mapping was done on a scale of one inch to two hundred feet using the existing engineers' map of the Pima mine as a base map. In addition to mapping, thin sections, polished sections and polished thin sections were examined to obtain more information about alteration and mineralization.

The term "Pima mining district" will be used here, as it was by Cooper (1960), to refer to the area on the east side of the Sierrita Mountains. The area includes the Pima, Mission, Twin Buttes, Esperanza and Sierrita open pit mines.