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Native platinum in pyrobitumen from Fonda, New York

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ABSTRACT

Native platinum occurs as submicrometer-scale inclusions in pyrobitumen at Fonda, New York. Pyrobitumens from the Appalachians should be examined for their metal content, which may provide information concerning metal migration.

INTRODUCTION

An unusual occurrence of native platinum is reported from Fonda, New York. Pyrobitumen of high rank (anthraxolite) occurs at numerous localities through the U.S. and Canadian Appalachians in Cambro-Ordovician limestones and the underlying Precambrian basement. Many occurrences are in base-metal sulphide deposits (De la Rue, 1941; Sangster, 1980). A sample of pyrobitumen from Precambrian basement rocks at Fonda, Mohawk Valley, New York, was examined using combined electron-microscopy and backscattered-electron imagery, as part of a survey of pyrobitumens from mineral deposits.

PLATINUM MINERALIZATION

The Fonda pyrobitumen is hard and brittle. It appears homogeneous in hand specimen and consists of 77.14% C, 3.68% H (atomic H/C ratio = 0.57) and 0.94% N. Electron microscopy showed that the "normal" pyrobitumen is crosscut by veinlets of pyrobitumen that are relatively enriched in Ca and S (Fig. 1). Along the centers of the veinlets are micrometer-scale inclusions of quartz and calcite, which are associated with sparse submicrometer-scale inclusions of pyrite, a nickel-iron sulfide phase, and native platinum (Fig. 2). The platinum, which contains no other alloyed metals, occurs within the calcite inclusions.

The Fonda pyrobitumen is one of numerous occurrences in the Mohawk Valley in Cambro-Ordovician limestones and the Precambrian syenite-gneiss basement, locally associated with sphalerite mineralization (Dunn and Fisher, 1954; Fisher, 1954). The pyrobitumen occurs in vugs, fractures, and inclusions in quartz crystals and appears to be a highly degraded and/or thermally altered residue of migrating petroleum. Geologic evidence suggests Early or Middle Silurian deposition of the pyrobitumen (Dunn and Fisher, 1954).

DISCUSSION

The occurrence of platinum in this setting is unusual as platinum is generally found in basic and ultrabasic rocks, placers, and rarely in contact-metamorphic deposits. However, association with organic materials has been recorded elsewhere. Kucha (1983) reported platinum in organometallic compounds in the Zechstein copper deposits of Poland. The platinum-rich organic material, and grains of platinum-group-metal alloys, occur in secondary calcite, as they do in the Fonda pyrobitumen (Kucha, 1981). There is evidence that platinum-group metals are transported by and precipitated from low-temperature aqueous solutions (Stumpfl and Tarkian, 1976), and organic compounds may be very important in facilitating this (Kucha, 1983). In the Fonda pyrobitumen the occurrence of platinum grains in crosscutting fractures in the pyrobitumen could be interpreted (1) as precipitation from organometallic compounds as the pyrobitumen was progressively carbonized or (2) as precipitation from later migrating fluids, induced by the reducing environment of the organic material.

It is not the intention of this note to account for the provenance of the platinum, but the location of the Precambrian platinum- and nickel-bearing deposit at Sudbury 640 km to the northwest is noteworthy. A pyrobitumen sample from the Sudbury district was examined

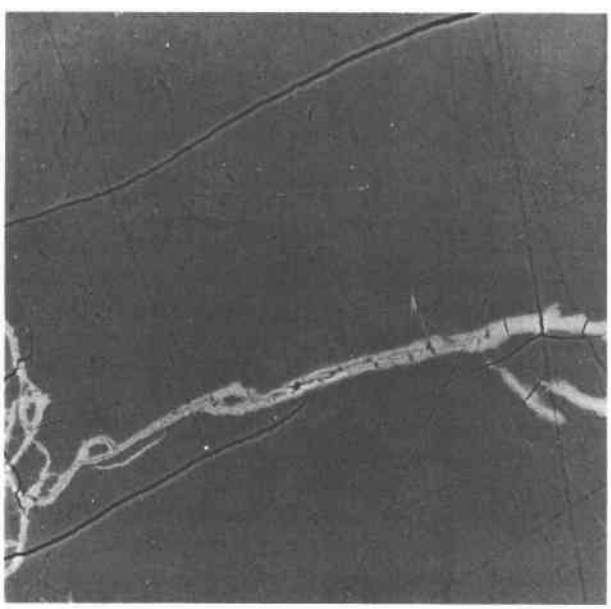

Fig. 1. Backscattered-electron image of pyrobitumen, showing veinlets (bright) enriched in Ca and S. Field width = 300 μm.

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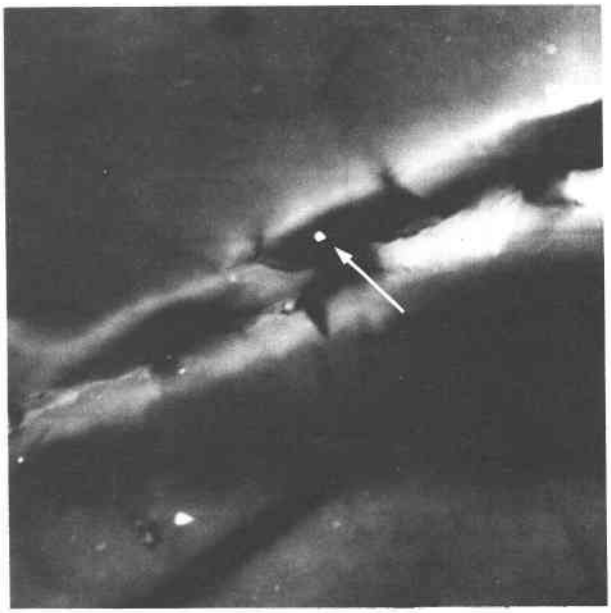

Fig. 2. Close-up of veinlet in Fig. 1 showing calcite (black) containing a microinclusion of native platinum (very bright, arrowed). Field width = 15 μm.

but no platinum was found, although the sample does exhibit numerous micro-inclusions of a nickel sulfarsenide phase. Studies of other pyrobitumens suggest that their inclusion chemistry may reflect the nature of ore deposits in their vicinity (Bath et al., 1986). For example, pyrobitumens from the silver-cobalt-nickel-arsenic mineralization of the Thunder Bay district, Ontario, have high nickel and cobalt contents (Ellsworth, 1934). Given that pyrobitumens are locally abundant in the New York–Quebec sector of the Appalachians and on the Canadian Shield and that many occur with ore minerals, there may be value in examining them for their ore-mineral inclusions, either as a potential resource of rare metals like platinum or as a source of information about metal migration.

Acknowledgments

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