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MANDARINOITE FROM THE DE LAMAR SILVER MINE, OWYHEE COUNTY, IDAHO, U.S.A.

R. LASMANIS
Canadian Superior Exploration Ltd., P.O. Box 10104, Pacific Centre, Vancouver, British Columbia V7Y 1C6

J. NAGEL
Department of Geological Sciences, University of British Columbia, 2075 Wesbrook Place, Vancouver, British Columbia V6T 1W5

B.D. STURMAN AND R.I. GAIT
Department of Mineralogy and Geology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6

ABSTRACT

This is the fourth locality from which mandarinoite has been identified. X-ray powder diagrams and the chemical composition of Idaho and Bolivia mandarinoite are virtually identical. The crystals from the new locality are slightly larger and allow better measurements of optical properties: α 1.715 (3), β 1.797(3), γ 1.86(1), $2V_x$ 80(5)°, $X \parallel b$, $c \wedge Z$ 2(1)° in the acute angle between a and c. Strong crossed dispersion. Pleochroic scheme: X colorless, Y pale green and Z pale green; absorption formula $Z \geqslant Y > X$.

Keywords: mandarinoite, ferric-iron selenite, Idaho.

SOMMAIRE

La mine d'argent de Lamar, Idaho (E.U.A.) est le quatrième gîte de mandarinoïte. Les clichés de poudre et la composition chimique des cristaux de l'Idaho et de ceux de la Bolivie sont virtuellement identiques. Les cristaux du nouveau gîte donnent de meilleures mesures des propriétés optiques: α 1.715(3), β 1.797(3), γ 1.86(1), $2V_x$ 80(5)°, $X \parallel b$, $c \wedge Z$ 2(1)° dans l'angle aigu entre a et c. Dispersion croisée forte. Pléochroïsme: X incolore, Y vert pâle, Z vert pâle; absorption: $Z \geqslant Y > X$.

Mots-clés: mandarinoïte, sélénite de fer ferrique, Idaho.

INTRODUCTION

Mandarinoite (Dunn *et al.* 1978) is a monoclinic, hydrated ferric-iron selenite $Fe^{3+}{}_2Se_3O_9 \cdot 4H_2O$ named after Dr. J.A. Mandarino of the Royal Ontario Museum (Gait 1978). The type material is from the Pacajake mine, near Hiaco, 24 km ENE of Colquechaca, Bolivia. Mandarinoite is also known from the Skouriotissa mine, Cyprus, and from the El Plomo mine, Ojojoma district, Honduras. In May 1978, one of the authors (R.L.) discovered a bright green mineral at the De Lamar mine in Idaho and collected five specimens, one of which was submitted to the University of British Columbia for identification. This examination established that the material was probably a new mineral, as it contained only iron and selenium (qualitative electron-microprobe analysis) and had an X-ray powder-diffraction pattern that could not be matched to any other known mineral. A coincidental meeting between Pete Dunn and one of the writers (J.N.) led to the proposal that the new green mineral might be mandarinoite (description then unpublished). A subsequent comparison of the X-ray powder-diffraction patterns proved this to be the case, confirming the fourth occurrence of mandarinoite.

LOCALITY

The De Lamar silver mine is situated in Section 5, Township 5S, Range 4W, Owyhee County, Idaho. The mandarinoite specimens came from the 6316-foot bench at coordinates 45,475 N and 98,030 E in the Sommercamp pit, near level 2 of the pre-1916 underground workings. The De Lamar mine is a modern open-pit mining operation that commenced production in 1977 and is operated by the Earth Resources Company. Unfortunately, the mine bench where the mandarinoite had been found has been mined out, and no further discoveries have been made to date.

Geology

The mineralization of the De Lamar mine is concentrated in northwest-trending siliceous veins in a quartz-feldspar rhyolite porphyry of middle Miocene age. Deposition of the primary minerals occurred at shallow depths from sodium chloride solutions. Potassium-argon age dates, obtained from adularia, for a similarly mineralized zone on nearby Florida Mountain fall between 14.8 and 15.2 ± 0.6 *Ma* (Panze 1975).

Primary minerals, in order of decreasing abundance, include pyrite, marcasite, naumannite, aguilarite, argentite (acanthite), pyrargyrite, miargyrite, chalcopyrite, sphalerite and gold. Most of these occur as finely disseminated masses in the porphyry. Secondary minerals include goethite, chlorargyrite, mandarinoite, silver, covellite and copper.

Mandarinoite

Mandarinoite occurs in narrow, open veinlets as pale lime-green crystals up to 0.5 mm long, in subparallel groups and as isolated, radiating rosette-like clusters up to 1.5 mm in diameter, perched on drusy quartz. The crystals are usually bright, shiny and transparent, but some have dull, frosted surfaces. Most of the drusy quartz crystals are terminated by dominant positive rhombohedra and are coated with a yellow-orange dusting of iron oxides. Chlorargyrite, AgCl, occurs as smooth, rounded, irregular masses and as crude, rounded cubic crystals of a pinkish-brown color. It is found on both the quartz and the mandarinoite crystals, suggesting that it crystallized later than either of these.

The crystals of mandarinoite have a habit similar to those from the type locality. SEM photographs are given by Dunn *et al.* (1978) and Wilson (1979). They are elongate parallel to [001] and slightly flattened on {100}. Most of the crystals are twinned, with (100) being both the twin plane and the composition plane. Two crystals were measured on the optical goniometer, and only three forms were identified: *a* {100}, *m* {110} and *d* {011}.

The X-ray powder-diffraction patterns of Idaho and Bolivian mandarinoite are virtually indistinguishable. The optical properties of the Idaho mandarinoite and the Bolivian material are very similar and are compared in Table 1. However, the small crystal size prevented accurate determinations. The differences between the two sets of data are constant within the limits of error and may not represent real differences. The indices of refraction were determined on a spindle stage, and the optic axial angle was determined on the universal stage. Because the Idaho crystals are slightly larger than those used in the original study, it was possible to make some observations on the dispersion and pleochroism of mandarinoite; both are properties that had not been reported. Strong crossed dispersion was observed on one fragment, but the value of the optic axial angle seems to be constant for all wavelengths. The larger crystals show weak pleochroism: X colorless, Y pale green and Z pale green; the absorption is $Z \geqslant Y > X$.

Idaho mandarinoite was semiquantitatively analyzed with an ARL–SEMQ electron microprobe using an operating voltage of 15 kV and a beam current of 0.15 μA. Comparison of this mandarinoite with the type material indicates that they are very nearly identical in composition. The Idaho material is homogeneous.

TABLE 1. THE OPTICAL PROPERTIES OF MANDARINOITE

		Idaho (This study)*	Bolivia (Dunn et al. 1978)
Refractive indices:	α	1.715(3)	1.715(3)
	β	1.797(3)	1.80(1)
	γ	1.86(1)	1.87(1)
	$2V_x$	80 (5)°	85 (10)°
Principal vibration directions:		X ∥ *b*	X ∥ *b*
		c ∧ Z = 2(1)° (in the acute angle between α and *c*)	*c* ∧ Z = 2(1)°

* ROM #M35602

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