Lepageite, \(\text{Mn}^{2+}(\text{Fe}^{3+}\text{Fe}^{3+}_4\text{O}_3[\text{Sb}^{3+}\text{As}^{3+}_8\text{O}_{34}])\), a new arsenite-antimonite mineral from the Szklary pegmatite, Lower Silesia, Poland

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ABSTRACT

Lepageite, a new arsenite-antimonite mineral, was discovered in a granitic pegmatite hosted by serpentinites of the Szklary massif, Lower Silesia, southwest Poland. Lepageite is a primary mineral formed during injection of an evolved LCT-type melt related to anatectic processes within the metasedimentary-metavolcanic complex of the nearby Góry Sowie Block, \(~380\text{ Ma}\), into serpentinite of the Szklary massif and its contamination by fluid-mobile serpentinite-hosted elements, among others As and Sb, transported in the form of \(\text{H}_2\text{AsO}_3\) and \(\text{HSbO}_3\) species at \(\text{pH} \approx 9–11\) and a low redox potential of \(-0.7\) to \(-0.3\) V.

**Keywords:** Lepageite, new mineral, arsenite, antimonite, chemical composition, crystal structure, crystallization conditions, Szklary, Poland

INTRODUCTION

The Szklary pegmatite is a small body of granitic LCT (Li–Cs–Ta) pegmatite hosted by serpentinites of the Szklary massif, Lower Silesia, Poland. It is considered to be part of the tectonically fragmented Sudetic ophiolite (Majerowicz and Pin 1986) and is about 420 Ma old (Oliver et al. 1993). In spite of its small dimensions, the pegmatite is notable due to (1) the presence of many rare and unknown minerals of various mineral groups, e.g., native metals and metalloids, Nb-Ta and Mn oxides, Mn phosphates with the apatite-group and grafitonite-group minerals richest in Mn worldwide, and numerous As-Sb accessory phases in the absence of typical löllingite and arsenopyrite; (2) very high degrees of Mn-Fe fractionation; and (3) the absence of sulfides and the occasional presence of baryte as the only phase containing sulfur (Pieczka 2010; Pieczka et al. 2011, 2013, 2015, 2018; Szuszkiewicz et al. 2018).

The assemblage of As-Sb minerals in the pegmatite (Table 1) evolves from zero-valent native As and Sb and their melts, through various As\(^{3+}\) and Sb\(^{5+}\) phases to pyrochlore-supergroup minerals in which As and Sb may occur also as pentavalent cations, and finally to As\(^{5+}\) substituting for P\(^{5+}\) in some phosphates. Such a sequence indicates the crystallization of the assemblage at varying Eh-pH conditions. Thus, considering valence states of As and Sb and other coexisting cations, the assemblage provides an opportunity to evaluate its formation conditions. In the paper, we discuss these conditions based on the composition of a newly discovered arsenite-antimonite mineral lepageite, ideally \(\text{Mn}^{2+}(\text{Fe}^{3+}\text{Fe}^{3+}_4\text{O}_3[\text{Sb}^{3+}\text{As}^{3+}_8\text{O}_{34}])\). Lepageite has been approved by the Commission on New Minerals, Nomenclature and Classification (CNMNC) of the International Mineralogical Association (IMA 2018-028). The name of the mineral is for Yvon Le Page (born October 7, 1943), a crystallographer who (1) developed the program MISSYM that has played a major role in the correct solution of complex mineral structures (including lepageite itself), and (2) solved the structures of many minerals and was involved in the description of several new minerals. The lepageite holotype (specimen Sz 96) is deposited in the collection of the Mineralogical Museum of University of Wroclaw, catalog number MMWr IV7926. The postal address of the museum is as follows: University of Wroclaw, Faculty of Earth Science and Environmental Management, Institute of Geological Sciences, Mineralogical Museum, Poland.

OCURRENCE

Lepageite was discovered in the Szklary LCT pegmatite (50°39.068′N, 16°49.932′E), ~6 km north of the Ząbkowice Śląskie town, ~60 km south of Wroclaw, Lower Silesia, southwest Poland. The massif is part of the Central-Sudetic ophiolite that adjoins the Góry Sowie Block (GSB) on the east. It is enclosed as a mega-boudin in the mylonitized GSB gneisses of the Early Carboniferous Niemcza Shear Zone. The pegmatite, completely excavated by mineral collectors in 2002, formed a north-northeast to south-southwest (NNE-SSW) elongated lens or a boudin <4 × 1 m in planar section, outcropped in the northern part of the massif. To the southwest, it has a primary intrusive contact with an altered aplite gneiss up to 2 m thick, and both rocks are surrounded by tectonized serpentinite (Szuszkiewicz et al. 2018). A vermiculite-chlorite-talc zone is locally present along the contact with serpentinite. The pegmatite corresponds to the beryl–columbite–phosphate subtype of the REL-Li pegmatite class in the classification of Černý and Erçil (2005). The pegmatite [383 ± 2 Ma; CHIME dating on monazite-(Ce), Pieczka et al. 2015] is significantly older than the neighboring small late-syntectonic diorite, syenite, and granodioritic intrusions (~335–340 Ma) occurring in the Niemcza Shear Zone (Oliver et