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Crystal structure and physical properties of a new platinum-group mineral Pašavaite, $Pd_3Pb_2Te_2$

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Pašavaite, $Pd_3Pb_2Te_2$, is a new palladium mineral species discovered at the Talnakh deposit, Taimyr Autonomous District, Russia. It was observed in two polished sections, where it occurs as subhedral grains not exceeding 20 μm in diameter embedded into polarite, and randomly accompanied by unknown Pd-Pb-Bi-Te phases and sperylite or intergrown with Au-Ag phases. The mineral is named in honour of Dr. Jan Pašava, for his role in long-term investigations of geochemistry of Platinum Group Elements, and his significant contribution to research on PGE deposits. The mineral and the mineral name have been approved by the Commission on New Minerals, Nomenclature and Classification of the IMA (CNMNC 2007-059).

Pašavaite could not be isolated for a thorough characterization due to its very small grain-size. Therefore, the analogue was synthesised. This synthetic $Pd_3Pb_2Te_2$ phase was used to determine physical properties, to measure reflectance, to collect powder data and to resolve the crystal structure. The stoichiometric amounts of respective elements were loaded into silica glass tube and heated in furnace at 400°C for 5 months.

Pašavaite is orthorhombic, space group *Pmmn*, *a* 8.599(1), *b* 5.9381(6), *c* 6.3173(8) Å, *V* 322.6(1) $Å^3$ and Z = 2. Its crystal structure can be described as a layered structure formed by face-shared $[PdPb_4Te_2]$ octahedra running parallel to (001). Two independent palladium atoms are surrounded by four lead and two tellurium atoms showing distorted octahedral coordination with tellurium atoms in *trans* positions with respect to one another. Two independent lead atoms are coordinated by six palladium atom in two different ways. The crystal structure of pašavaite shows many structural similarities to the structure of shandite ($Ni_3Pb_2S_2$, $R\bar{3}m$) and parkerite ($Ni_3Bi_2S_2$, $C2/m$).

The structural identity of pašavaite and synthetic material was confirmed by results of the electron back-scattered diffraction (EBSD) study. The EBSD patterns (also known as a Kikuchi bands) obtained from natural grains easily matched the patterns generated from structure data of $Pd_3Pb_2Te_2$ provided by our crystal structure solution.