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Uncommon mineral assemblage from a burnt-out coal heap in Salgótarján, Hungary

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Salgótarján, located in northern Hungary, lies within the Nógrád Basin, where the Lower to Middle Miocene Salgótarján Lignite Formation hosts significant coal deposits. This formation consists of clay marl, sand, and lignite seams formed in a fluvial-lacustrine environment. Coal mining in the region spanned from the mid-18th century until 1992, with peak production in the early 20th century. The Károly Shaft operated between 1889 and 1914, contributing to regional extraction [1]. Its waste heap has undergone self-ignition, which lead to extensive mineral transformations. In recent years, remediation efforts have begun, and a new excavation revealed a mineral association which is the focus of the current study.

Due to thermal activity, pyrometamorphic processes [2] have mainly led to the formation of red, black, and yellow buchites, with only small amounts of clinkers. In some areas, remnants of the original coal seams are still visible. The mineral assemblage found here is quite unusual and diverse. A Ca-Fe rich pyrometamorphic assemblage is present, with high-temperature minerals such as esseneite and hematite. Low-temperature processes like hydration and recarbonation have created a variety of retrograde minerals, including gypsum, calcite, aragonite, dolomite, brucite and natrojarosite. Additionally, an active coal seam pseudofumarolic assemblage is found, containing minerals like alunogen, jarosite, and hydrokenoralstonite. A phosphate-arsenate assemblage, including fluorapatite, rare-earth element phosphates and Mg-arsenates, is also present.

This study aims to provide a detailed description, genetic analysis, and geochemical investigation of this complex mineral paragenesis, using SEM-EDS and Raman spectroscopy to achieve the outlined goals.

[1] Dósa, Józsa, & Martényi (2006), Bányászati és Kohászati Lapok, 2006/3. 15-22. (in Hungarian)

[2] Ciesielczuk, Kruszewski & Majka. (2015), International Journal of Coal Geology, 139, 114-141. DOI: 10.1016/j.coal.2014.08.013.