Genetic Study of the Sphalerite from Rudabánya

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The Rudabánya Ore Complex (northeast Hungary) has a mining history dating back to the Middle Ages. At first, native copper was exploited, which was followed by silver and iron mining. The mining ended in the middle of the 20th century, though new exploration took place in the late 1990s and in the 2000-2010s. These projects drew attention to the Zn(-Pb) and Ba prospects.

The Complex is hosted by Lower Triassic carbonate and siliciclastic rocks. Although the deposit is best known for its siderite content, novel studies confirmed its polymetallic character. According to our present knowledge, the mineralization formed during several superimposing events: (1) early stage, stratiform Pb-Zn ores in Lower Triassic siltstone; (2) metasomatic siderite hosted by dolomite in higher stratigraphic level; (3) Cu-Pb-Ba-Ag mineralization bound to the contact of the dolomite and the black shale; (4) supergene alteration of the primary sulphides, and (5) low-temperature hydrothermal Hg-As-Sb-Ag enrichment. Recent studies suggest that there are two types of different Pb-Zn ores with identical mineral paragenesis (sphalerite, galenite, pyrite, barite, carbonates), but their genesis is still a question of debate. The minerals of the type (1) ore form massive layers or lenses, whilst the type (2) ores are vein filling.

Sphalerite of type (1) ore contains lower amounts of iron (up to 0.2 mol % FeS) compared to sphalerite of type (3) ore (commonly 3-8 mol % FeS). This suggests lower formation temperature for type (1) ore (<100°C) and higher formation temperature for type (3) ore (100°–250°C). Detailed EPMA analyses of sphalerite revealed differences in trace element content: sphalerite of type (1) ore contains higher amounts of Hg, Ag, and V and lower amounts of Cd compared to sphalerite of type (3) ore. Mineral chemical studies confirm the formerly presumed MVT s.l. (so-called Alpine-type Pb-Zn) deposit classification for type (3) ore.