Paper Number: 2022

Fe (Ti, Cu) mineralizations in NE Poland and S-SE Lithuania: their possible links and implications for regional evolution

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Precambrian crystalline basement in Lithuania and N Poland is covered with sediments and studied by means of drilling and geophysics. Hundreds of drillings and their cores provide sufficient material for a reconstruction of major boundaries, rock units and their evolution.

Precambrian rocks in the Suwałki region in NE Poland, Lazdijai and Varena areas in southern and south-eastern Lithuania are enriched in polymetallic mineralization such as Fe, Ti, V, Cu, Ni, Co, Cr and REE. Fe-Ti-V ore deposits responsible for gravity and magnetic anomalies in the Suwalki area were recognized as layered or vein-like bodies at 900-2600 m depth within the Mesoproterozoic (c. 1.55 Ga) anorthosite diapiric massif, surrounded by granitic members of the Mazury Anortosite-Mangerite-Charnockite-Granite (AMCG) suite. Dispersed Fe-Cu-Co-Ni sulphide mineralization is also present in the Suwalki magmatic bodies. Isotopic studies (Rb/Sr, Sm/Nd and Re/Os) on the Suwalki anorthosite have shown that the parent magma results from partial melting of a mafic lower continental crust [1 and 2].

Further north, the c. 1.83-1.79 Ga Lazdijai 13 volcano-sedimentary sequence in S Lithuania features signs of iron and copper mineralization. The sequence is mainly composed of metamorphosed peralumineous tholeiitic rhyolites and calc-alkaline andesitic volcanics, interlayered with silica-clastic and carbonate sediments, crosscut by pegmatitic granite and quartz veins. The rocks have experienced amphibolite facies thermal metamorphism of 650°-570° C and 4.5 kbar at 1.53-1.50 Ga as was implied from the EPMA chemical dating of monazites. Redox conditions were estimated using the magnetite-ilmenite geothermobarometry [3], which yielded 405° C temperature. We assume that the metamorphism was caused by an intrusion of nearby 1.55-1.50 Ga AMCG Mazury complex which was also a major source of metasomatising fluids. During the subsequent cooling, rocks have been exposed to hydrothermal alteration, causing a nucleation of Fe-Cu sulphides.

The large Varena Iron ore deposit at the depths of 250-850 m in SE Lithuania is hosted by metaigneous (amphibolites, orthogneisses) and metasedimentary (paragneisses and marbles) rocks. The richest magnetite ore bodies occur in magnesium skarns formed after marbles. It is likely that primary calciphyres and forsteritic skarns were later reworked by iron-rich fluids turning them into magnetite-serpentinite ores [4]. The nearby 1.86-1.80 Ga Randamonys gabbros and gabbro-norites may be a source for iron because of similarities in magnetite composition (presence of V, Ti, Ni etc). The fluids likely came from c. 1.50 Ga Marcinkonys granite intrusions coeval with the Mazury complex. They might have also generated later apatite, sulphide, REE, U and Th enriched veins crosscutting the Varena Fe ore bodies.

To sum up, most of the polymetallic mineralization in N Poland and S, SE Lithuania is variably related to the within-plate 1.55-1.50 Ga AMCG intrusions. It is not unlikely that even Fe and other metals in the

Varena iron ore deposit came from the c. 1.55 Ga Suwalki Fe-Ti-V deposits; however the age of the Varena mineralization should be better reconstructed yet.

References:

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