Pb, Sr, and Nd isotopes and geochemistry of Miocene magmas in the Apuseni Mountains, Romania

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The Apuseni Mountains, Romania, are known primarily for hosting Europe's largest Cu-Au ore district. This study aims to characterize the chemical and Sr-Nd-Pb isotopic compositions of the fresh magmatic rocks sourcing the ore deposits. These data will be used to identify the geodynamic processes potentially responsible for magma and ore formation. Miocene magmatism in the Apuseni Mountains is dominated by shallow stocks emplaced in structurally controlled NW-SE trends from 14.7 – 7.4Ma [1]. Magma compositions are calc-alkaline to alkaline, basaltic to dacitic and predominantly andesitic. The youngest intrusion is 1.6 Ma and is the most alkaline. Numerous younger rocks fall within the chemical and isotopic definitions of adakites, displaying high Sr/Y ratios, HREE depletions and MORB-like Sr and Nd isotopic compositions. Although a link to subduction can not be excluded at this time, these adakite-like signatures are thought to represent extension during rotation of lithospheric blocks indenting the Carpathian arc [2].

Incompatible trace element diagrams normalized to primitive mantle values are consistent with magma origin by subduction-related processes. Characteristic features include Nb-Ta depletions and LILE enrichments. Preliminary Sr-Nd isotopic data indicate contribution of at least two sources to the magmas (depleted mantle and continental crust). Younger magmas tend to have less radiogenic $^{87}Sr/^{86}Sr$ (0.7038 – 0.7047) and slightly more positive εNd (-0.01 – +3.3) values than the older magmas ($^{87}Sr/^{86}Sr$ = 0.7072 – 0.7080; εNd ~ -3). Despite these variations in Sr-Nd isotopes, preliminary Pb-isotopes indicate similar compositions ($^{206}Pb/^{204}Pb$ = 18.64 – 18.72, $^{207}Pb/^{204}Pb$ = 15.62 – 15.68, $^{208}Pb/^{204}Pb$ = 38.42 – 38.83). Two alkaline samples exhibit slightly less radiogenic values. Geochemical trends will be further analyzed to investigate the formation of adakite-like magmas and ore formation within a possibly non-subduction related geodynamic context.

References

[1] Roşu et al. (2004) *SMPM* **84**, 153-172.
[2] Seghedi et al. (2004) *Lithos* 72, 117-146.