

Preliminary geochemical study of Puyango deposit, Ecuador, applying statistics

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Introduction

A geochemical study of the V, U and Zn cretacic deposit of Puyango, Ecuador, in bituminous limestones, has been carried out, making multielemental chemical analysis (ICP-MS) and total organic carbon (TOC), as well as multivariate statistical analysis, including: correlation coefficients, cluster analysis and factor analysis of elements and rocks samples to determine geochemical associations.

Discussion of Results

Through factorial geochemical analysis, four geochemical associations can be inferred mainly: 1) disseminated organic matter in the limestones in which V and Zn are hosted, forming perhaps organometallic complexes [1, 2], 2) phosphatic minerals that contain high concentrations of U, HREE and Ni as trace elements [3], probably both associations formed during sedimentation in an anoxic environment, 3) carbonates (Ca) forming calcite in a marine environment, which corresponds to the geological descriptions of the Fm. Puyango and, 4) detritic minerals such as quartz, plagioclase, feldspar, micas, clays and oxyhydroxides of Fe-Mn-Ti, product of the clastic contribution within the sedimentary basin.

V is mainly associated with the organic matter of marine origin disseminated in the bituminous limestones [1], inorganic V may have formed (vanadate minerals have been identified as sherwoodite and ronneburgite, previously). Finally, U is associated with P in the analyzed samples, which indicates that uraniferous phosphates must have formed during sedimentation (apatite and uranosphatite have been identified previously).

[1] Gao, Y.Y., et al., Vanadium: Global (bio) geochemistry, *Chem. Geol.* **417** (2014) 68-89. [2] Scott, C., et al., The hyper-enrichment of V and Zn in black shales of the Late Devonian-Early Mississippian Bakken Formation (USA). *Chem Geol.* **452** (2017) 24-33. [3] McArthur, M., and Walsh, N. Rare-earth geochemistry of phosphorites. *Chem Geol.* **47** (3-4) (1984) 191-220