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Mineralogical and Chemical Studies of Volcanic-Related Argillaceous Industrial Minerals of the Central American Cordillera (Western El Salvador)

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Abstract

The western provinces of El Salvador, which are covered almost exclusively by igneous rocks, offer favorable conditions to study the entire suite of volcanic-related, nonmetallic deposits involving accumulations of zeolite-feldspar, smectite, kaolinite, and diatomite. Formation of nonmetallic deposits, which is still going on in the active geothermal field near Ahuachapán, began during the late Pliocene. This age is based on micropaleontological data obtained during the study of lacustrine sediments laid down in volcanogenic depressions. Judging by their regional distribution and geological setting, the deposits may be subdivided into regional deposits (T <100°C) and structurally controlled deposits (T = 140°–250°C). Both types of volcanic deposits can be further subdivided into various stages:(1) zeolite-feldspar stage, (2) smectite stage, (3) quartzkaolinite stage, (4) kaolinite-cristobalite stage, and (5) kaolinite stage. Stages (4) and (5) are characterized by the presence of alunite-, woodhouseite-, and crandallite-group minerals and some minerals of the aluminite-alunogen group. Within the deposits, gradual changes (progressive vs. regressive trends) may be attributed to various alteration processes. The progressive trends are correlative with the differentiation of the mineralizing fluids throughout hydrothermal activity and supergene alteration. The regressive trends are caused by hot-spring diagenesis. Knowledge of the minerostratigraphy in a geothermal field and of the intracrystalline processes within minerals such as siliceous compounds and aluminum-phosphate-sulfate minerals may help to answer the question of whether hypogene or supergene processes have triggered nonmetallic mineralization. The major and trace element compositions (Ag, As, Be, Co, Cr, Cs, Cu, Ge, Hf, Hg, Mo, Nb, Ni, Pb, Rb, Sb, Se, Sr, Tl, Th, U, V, Y, Zn, Zr, and REE) for several argillaceous deposits are presented in this paper. Cross plots using the couples Ba + Sr vs. Ce + Y + La, Ti + Fe vs. Cr + Nb, and Zr vs. Ti may help discriminate hypogene and supergene kaolin concentrations in these epithermal argillaceous deposits. The nonmetallic deposits represent a subtype of high-sulfidationtype deposits . The Salvadorian deposits formed distally to the arc-trench gap and belong to the most recent stages of the Cenozoic Ando-Caribbean mineralizing processes.