Gold-rich epithermal liquid by contraction of magmatic vapor

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Vapor inclusions in porphyry-type ore deposits commonly contain very high concentrations of Cu, As and Au [1]. This observation has been taken to suggest that magmatic vapor may be an essential ingredient for the formation of rich epithermal precious-metal deposits, as opposed to thermally convecting meteoric (‚geothermal') water leaching the ore-forming components from solid rocks. Thermodynamic data indicate that magmatic vapor can homogeneously contract to a gold-rich aqueous liquid, if it cools at elevated pressure above the critical curve of the saline fluid system, and if it contains enough sulfur for gold complexation [2]. Preliminary hydrodynamic modeling [3] indicates that magmatic vapor contraction is a plausible process in hydrothermal systems that are driven by cooling of a subjacent hydrous magma chamber.

This contribution confirms these predictions with two sets of new data. First, we demonstrate that metal-rich magmatic vapors are indeed sufficiently sulfur-rich to support the required Cu-S and Au-S complexes, based on progress in the quantification of S in fluid inclusions by LA-ICPMS microanalysis [4, 5]. Second, we present the first fluid inclusion analyses of exceptionally metal-rich epithermal liquids from the Famatina system in Argentina [5]. Geological timing relationships indicate that the gold-rich aqueous liquids in quartz – sericite – pyrite veins were formed by contraction of magmatic vapor at the transition, in space and time, from subeconomic porphyry mineralization to rich high-sulfidation epithermal gold – telluride ores.

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Influence of organic matter content on specific surface area of a Eutric Cambisol and its particle size fractions from Ultuna (Sweden) determined by different methods

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The determination of specific surface area (SSA) of soils is important in order to estimate the ability of a soil to retain certain compounds. There are different methods available for measuring SSA. But since the various adsorbates used in these methods exhibit different adsorption affinities for different types of surfaces, the determined SSA can differ significantly depending on the adsorbate used. Normally, N_2-physisorption at 77 K according to Brunauer, Emmett and Teller (BET-N_2) is done, but it is known that nitrogen has a low affinity to organic surfaces. Ethylene glycol monoethyl ether (EGME) is an organic liquid which is known to additionally enter organic material and interlayer surfaces of clay minerals leading to an increased measured SSA.

We investigated SSA by means of BET-N_2 and EGME retention of bulk soil and particle size fractions of a Eutric Cambisol from a long-term field experiment in Ultuna, Sweden. For several decades, the soil received either a treatment with $Ca(NO_3)_2$ fertiliser or animal manure. Due to the different amount of organic material present (15 g C kg^{-1} for the $Ca(NO_3)_2$ treated soil and 21 g C kg^{-1} for the manure treated soil), SSA varied between 13.1 and 19.6 m^2 g^{-1} for BET-N_2 and 53 to 86 m^2 g^{-1} for EGME. At low organic matter content, a linear relationship between N_2- and EGME-surface areas was observed. Calculated C constants from BET-N_2 determinations indicated that with higher organic matter content, the binding affinity for nitrogen decreases. However, removal of organic matter by oxidation with H_2O_2 led to differing results. In the silt fractions, the C constants actually decreased. We assume that iron oxides which contribute significantly to the SSA in these fractions were closely associated with the organic material and were partially modified or dissolved and eluted by this treatment.