Organic-inorganic interaction of hydrocarbons with the Lanping Zn/Pb ore deposit, near the Indo-Eurasian collisional margin, Southeastern Tibetan Plateau

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Mineral sulfides have always been the subject of studies on the organic-inorganic interaction, seafloor hydrothermal systems and origin of life [1]. Many studies of organic-inorganic interaction have described the catalytic effect of mineral components (e.g., Zn, Fe, Cu, Cr, Mn and Ni) in laboratory perspectives, while few works on the mineral catalytic effect of hydrothermal organic transformations have been noted and focused in field persepectives. A striking question remains—could mineral (ZnS/PbS/FeS_2) catalysis be a dominant factor controlling organic transformations?

The freshly mined crude ores containing oil and solid bitumen and the unmineralized host sediment were sampled in Lanping. Our molecular level analysis shows that, from unmineralized host sediment through oils to the solid bitumen, a stepwise interaction of organic compounds with ascending metal-bearing hydrothermal fluids were demonstrated by increase in abundance of phenyl/sulfur/oxygen-containing compounds that are thought to result from hydrothermal catalytic conversion (HTCC), challenging the classic paradigm of thermodynamic equilibrium and microbial process in conventional petroleum reservoirs. Metastable equilibrium was observed among those hydrothermal compounds. Our results offer a transformative perspective of organic-inorganic geochemistry that may shed light on future deep petroleum exploration.

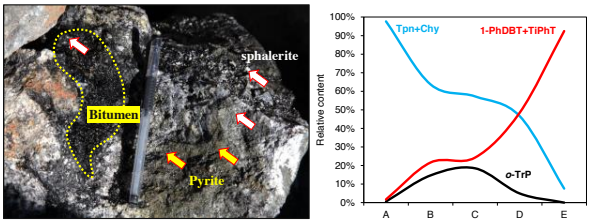

Figure 1: The Zn/Pb crude ore and the HTCC processes.

[1] Shipp *et al.* (2014) PNAS **111**, 11642.