Major, Minor and Trace Element Evolution of Phanerozoic Seawater: Implications for the Carbonate Reservoir Rocks

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ABSTRACT

Study of primary fluid inclusions trapped in marine halite and calcite from various Phanerozoic sedimentary basins will provide a better understanding of the chemical evolution of seawater and the properties of carbonate reservoir rocks. Absolute concentrations of 21selected major, minor and trace elements in fluid inclusions using combined Laser ablation-inductively coupled plasma-mass spectrometry (LAICP-MS) and scanning electron microscope coupled to an x-ray energy-dispersive system (SEM-EDS) will help resolve which major geochemical processes controlled the composition of Phanerozoic seawater. Earlier studies suggest that secular changes in seawater chemistry are influenced by fluctuations in mid-ocean ridge hydrothermal brine flux, changes in deposition rates of shallow marine carbonates and dolomitization, and variations in continental weathering rates. Fluid inclusions will be analyzed from a large suite of Neoproterozoic and Phanerozoic marine halites and from Devonian and Cretaceous marine calcite cements. Preliminary results show that variations in minor and trace elements are in phase with reported secular variations in major seawater ions. I hypothesize that conservative minor and trace elements are more sensitive to changes in marine geochemical processes than major elements, which may lead to new insights about the factors that controlled Phanerozoic seawater chemistry. LA ICP-MS analyses of unevaporated fluid inclusions in marine calcite cements have never been reported, and so would represent a breakthrough in our understanding of the chemistry of Phanerozoic seawater.

AAPG Search and Discovery Article #90321 © 2018 AAPG Foundation 2018 Grants-in-Aid Projects