Rare Earth Element Concentraions in Themal Oil and Gas Brines In Wyoming

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The US Department of Energy's Geothermal Technologies Office is funding research by the Idaho National Laboratory (INL), University of Wyoming (UW) School of Energy Resources (SER), and the United States Geological Survey (USGS) to describe rare earth element (REE) concentrations in oil and gas produced waters and other thermal waters. The project has two main objectives: 1) to develop and refine methods to measure natural concentrations of REEs in these complex waters, and 2) to use these methods to produce a first of its kind, publicly available dataset of natural aqueous REE concentrations.

The 130 presently sampled waters represent a wide variety of temperatures, depths, lithologies, and salinities. REEs exist at the parts per trillion level in all waters sampled for this project and as shown in Figure 1 individual REEs can exceed 70ppt. Wyoming oil and gas brines contain elevated levels of europium relative to other REEs (Eu/Eu* is 3.96 to 41.10 post-NASC). These samples reveal how reservoir conditions affect REE concentrations. Preliminary results suggest that water type and ligand character control REE trends.

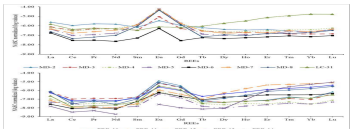

Figure 1 NASC-normalized REE patterns for selected Wyoming oil and gas waters.