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Recovery of Rare Earths, Precious Metals and other Critical Materials from Geothermal Waters with Advanced Sorbent Structures (Abstract)

CRADA #355 (PNNL #66469)

April 2024

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Star Minerals

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Richland, Washington 99354

Abstract

The ability to recover valuable trace level minerals from geothermal brines using high-performance solid-phase sorbents will be explored and developed. A comprehensive range of sorbent materials will be screened for application to metal extraction from geothermal brines. Preferred sorbents for extraction of trace levels of rare earths (REs), precious metals (PMs), and other critical/strategically valuable materials (CMs) such as Zn, Mn, Te, Sc, Se and U from geothermal brines will be identified. For the preferred sorbents PNNL will determine the volumes they are capable of providing efficient extraction from. The thermal and chemical limits (including, acid, sulfur, salt) for performance of the preferred sorbent materials will be determined; with a target of at least 125°C and perhaps as high as 400° C. Sorbent form factors (including, packed bed, membrane, mats) that can function efficiently and be installed cost effectively in geothermal energy plants will be assessed for chemical and economic viability. Material regeneration and cyclic utilization will be demonstrated, targeting hundreds to thousands of cycles. Options for recovery and purification (including, selective separation of heavy REs) of collected materials will be explored. A techno-economic analysis (TEA) will be performed to assess the best approach to provide a value-added extraction process for geothermal energy systems. The sorbent materials and engineering analysis will be applicable to other industrial processes in which secondary recovery of valuable materials could provide economic benefit.

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