

NE-19-18706, Metal Organic Frameworks for Noble Gas Management in the Liquid Fluoride Thorium Reactor

Flibe Energy recognizes that the Liquid Fluoride Thorium Reactor (LFTR) introduces potentially unique challenges to the management of noble-gas fission products. By utilizing a liquid fuel form with active removal of fission product xenon from the fuel, the LFTR is capable of highly dynamic load-following behavior. This is an asset for integration into a mixed energy generation portfolio which includes variable-generation sources such as wind and solar power. However, active removal of noble-gas fission products from the fuel salt also presents challenges to the facility design.

Pacific Northwest National Laboratory developed and demonstrated large number of nanostructured materials called metal-organic frameworks for selective removal of xenon and krypton (ppm level) from process off-gases using solid sorbents at near-room temperature. For this project, Flibe Energy and PNNL will evaluate the commercially available metal-organic frameworks in an engineered form to capture Xe selectively from simulated LFTR off-gas. This will establish the viability of designing a dramatically improved approach to noble gas management as compared to activated carbon.