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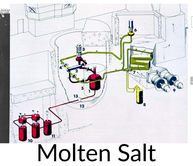
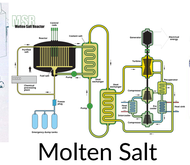
History of Molten Salt Reactors

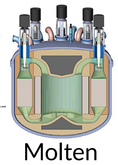
Aircraft Reactor Experiment (1954)



Molten Salt Reactor Experiment (1965)

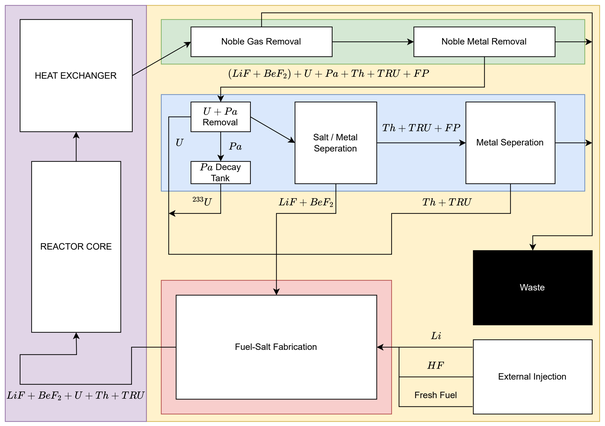


Molten Salt Breeder Reactor (1970-1976)



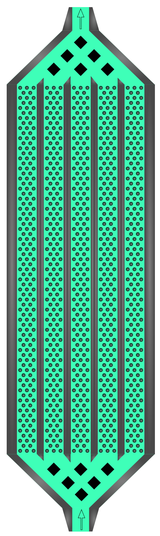
Molten Chloride Fast Reactor (+2025)

Online Processing Layout



Simplified prototypic online processing scheme adapted from the various schematics in [3].

Online Processing Components



Top [1], Bottom [2].

Online processing in molten salt reactors increases **fuel utilization & burnup**, enables **load following**, and extends **component lifetime.**

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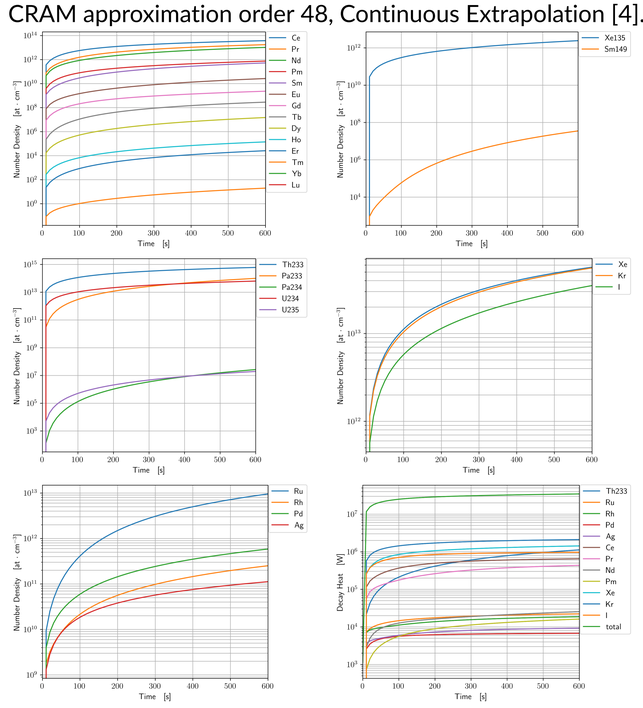
Scan to go to our **Abstract** →

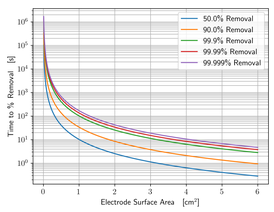
Source / Decay Heat Rates

Simulations conducted with OpenMC's depletion module. CRAM approximation order 48, Continuous Extrapolation [4].



Processing Efficiencies

Gas sparging and noble-metal plate processing requires 20s and 50s, respectively. Electrochemical extraction is typically diffusion driven, limited literature on advective impacts. [3]



- Tungsten Electrodes
- Applied Current of 0.12 A [5]
- Diffusion Coefficient for U^{4+} as $1.28 \cdot 10^{-6}$ $cm^2 s^{-1}$ [5]
- Sand's Law

References

[1] Blue Powder Metallurgy, BLUE Sintered Filter Cartridge.

[2] CG Thermal Process Technology Solutions, Graphite Heat Exchanger.

[3] *Molten Salt Reactors and Thorium Energy*. Elsevier, 2024. ISBN: 978-0-323-99355-5.

[4] Paul K. Romano et al. "OpenMC: A state-of-the-art Monte Carlo code for research and development". In: *Annals of Nuclear Energy* 82 (2015), pp. 90–97. ISSN: 0306-4549.

[5] Martin Straka, M. Korenko, and F. Lisý. "Electrochemistry of uranium in LiF–BeF 2 melt". In: *Journal of Radioanalytical and Nuclear Chemistry - J RADIOANAL NUCL CHEM* 284 (Apr. 1, 2010), pp. 245–252.