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Numerical Modeling of Fluid Flow in a Molten Salt Reactor

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Molten Salt Reactors (MSRs) are a generation IV reactors that have been selected by the World Nuclear Association for its potential in the advancement of reactor sustainability, economics, safety, reliability, and proliferation-resistance. MSRs were originally designed in the 60s by Oak Ridge National Laboratory and have recently gained popularity. Literature shows differing mixed composition of uranium and fluoride salts being utilized in the reactor core. Depending on the mixed composition, each mix has different effects on the core overall temperature distribution. Temperature distribution within the reactor is important due to safety concerns. In addition, the overall output temperature determines the power output and efficiency of the reactor. This research effort involved studying the temperature variation in MSRs when different salt mix is used. Computational Fluid Dynamics (CFD) was used as a tool to study the influence of the different mixes on temperature distribution and geometry in homogenizing the flow velocity within the reactor. This research may lead to a more reliable, efficient and safer MSR reactor design.