

Fundamental Understanding of Pebble Bed Nuclear Reactors for Environmentally Benign and Risk Free Proliferation 4th Generation Nuclear Energy and Hydrogen Production

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Pebble bed nuclear reactor is among the 6 suggested 4th generation nuclear reactors. It is also one of the advanced high temperature gas nuclear reactors (AGRs). In such reactor the pebbles that contain the nuclear fuel particles (TRISO) (~900-950 micron) move downward while high temperature helium moves upward. These pebbles are circulated until they are spent. The pebble bed nuclear reactors are characterized as environmentally benign, risk free proliferation with high thermal efficiency (about 55% while the current nuclear reactor technology provides ~ 35%). The fundamental understanding of these reactors is lacking. Therefore, this work as a part of the research program on high temperature reactors through the consortium consists of University of Missouri – Columbia, Missouri S&T, North Carolina State University focuses on the detailed hydrodynamics of the pebbles movement, gas dynamics and heat transfer using both advanced measurement and computation techniques. The progress made on this project at Missouri S&T will be presented and the future work will be outlined.