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The development of a computer code for predicting fast reactor oxide fuel element thermal and mechanical behavior (FIBER-Oxide)

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The in-core behaviors of fast reactor oxide fuel element are highly complicated and coupled due to the overall irradiation, thermal and mechanical effects. The structural integrity of fuel cladding in steady and transient conditions is important for the safe operation of reactors. A computer code FIBER-Oxide is developed to simulate fuel element behavior and further to predict life. First, based on international open literatures, the main adopted material property models are presented. Second, according to solid heat transfer equation and mechanical equilibrium equation, numerical resolving equations for fuel pellet and cladding are derived and established. Finally, the general computation procedures are given and a sample is tested. The successful operation demonstrates the feasibility of adopted modeling methods. The future further development priorities for the code are also proposed. The development of FIBER-Oxide lays the foundation for the independent design of China fast reactor fuel element.

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