

TPP diagram analyses for investigating gas-solid reactions on voloxidation process

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Voloxidation is a process for converting UO_2 into U_3O_8 while removing some volatile products in spent fuels (SF). Various oxidative gas conditions including air and mixture of Ar and O_2 could be adopted for the process. The gas flows into a reactor under high temperature ($> 500^\circ\text{C}$) and components of SF are reacted with the gas. SF is composed of various components such as actinides, lanthanides, and alkali metals. Therefore, it is of significance to understand their behavior during the reactions for process development. However, due to the limit of available experiments, phase diagram analysis should be preceded. TPP diagram is constructed with respect to temperature-pressure-pressure. It shows a stable phase depending on partial pressures of gas components as well as temperature. In this work, we investigated TPP diagrams for actinides, lanthanides and other oxides to determine stable oxide forms under different gas conditions. The results would be used to set up a material balance under a pyroprocessing scheme of SF and compare the gas conditions for the optimization of fission products removal.