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Calculation of thermal conductivity of $UO_{2\pm0.25}$ solving phonon Boltzmann equation

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Abstract
In this study, the effect of point defects on the thermal conductivity of UO_2 is investigated. Especially, the effects of oxygen vacancy and interstitial are considered. Thermal conductivity of UO_2, $UO_{2+0.25}$ and $UO_{2-0.25}$ is calculated by solving the phonon Boltzmann equation (BTE) under the relaxation time approximation (RTA). The results show that introducing any defects to the lattice structure of UO2 decreases thermal conductivity significantly. In addition, the results show that the variation of the thermal conductivity of $UO_{2-0.25}$ is much lower than that of $UO_{2+0.25}$ in the temperature interval of 300 to 1000 Kelvin.

Keywords: uranium dioxide, phonon Boltzmann equation, thermal conductivity, phonon lifetime, defect

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