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Solid state diffusion interactions of metallic uranium with technetium

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In metallic nuclear fuels, uranium will interact with fission products formed at higher burn-ups. Understanding the binary interactions between components is helpful in building a description of the overall system consisting of fuel and fission products. Many of the fission product metals are easy to obtain and study in reactions with metallic depleted uranium to simulate conditions in an active metallic nuclear fuel. Technetium is a major fission product (~ 6% from ^{235}U) and very little is known about its interaction with uranium: only one phase has been identified (i.e., U_2Tc) and no Tc-U binary phase diagram is reported. In this study, the interaction between metallic uranium and technetium at elevated temperature has been investigated. Discs of uranium and technetium were prepared into a couple and heat treated at 1023 K for 120 h. After treatment, the couple was analyzed by Electron Microscopy and the U_2Tc phase was identified. In order to better understand the physico-chemistry of binary alloys of uranium with transition metals, discs consisting of uranium with molybdenum, rhenium and ruthenium were prepared, heat treated at 1023 K and analyzed by Electron Microscopy.

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