Recrystallization kinetics of warm-rolled tungsten in the temperature range 1150-1350 °C

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Pure tungsten is a potential candidate material for the plasma-facing first wall and the divertor of fusion reactors. Both parts have to withstand high temperatures during service. This will alter the microstructure of the material by recovery, recrystallization and grain growth and will cause degradation in material properties as a loss in mechanical strength and embrittlement. The thermal stability of a pure tungsten plate warm-rolled to 67% thickness reduction was investigated by long-term isothermal annealing in the temperature range between 1150 °C and 1350 °C up to 2200 h. Changes in the mechanical properties during annealing are quantified by Vickers hardness measurements. They are described concisely by classical kinetic models for recovery and recrystallization. The observed time spans for recrystallization and the obtained value for the activation energy of the recrystallization process indicate a sufficient thermal stability of the tungsten plate during operation below 1075 °C.

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