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Optimization of the thermomechanical treatment to achieve a homogeneous microstructure in a 14Cr ODS steel

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Oxide dispersion strengthened (ODS) ferritic steels are promising candidates for high burn up fuel pins of Sodium Fast Reactors. They are elaborated by powder metallurgy and their manufacturing route is complex and specific, including hot forming and cold working. Different heat treatments are necessary to recrystallize these materials and to relieve internal stresses. The presence of highly stable nano-oxides and the limited stored energy after elaboration can make the recrystallization temperature extremely high ($> 0.9 T_{\text{melting}}$). The aim of this paper is to present the results of a generic study conducted on the recrystallization mechanisms in ODS materials. Model alloys with specific deformations by cold working were studied. It comes out that the direction along which the samples are deformed is determining to increase the driving force for recrystallization and obtain homogeneous microstructures, more than the rate of cold-working applied.

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