Microstructural Analysis of Orientation-Dependent Recovery and Recrystallization in a Modified 9Cr-1Mo Steel Deformed by Compression at a High Strain Rate

The evolution of the microstructure and texture during annealing of a modified ferritic/martensitic 9Cr-1Mo steel compressed by dynamic plastic deformation (DPD) to a strain of 2.3 has been investigated using transmission electron microscopy and electron backscatter diffraction. It is found that the duplex 〈111〉 + 〈100〉 fiber texture formed by DPD is transformed during annealing to a dominant 〈111〉 fiber texture, and that crystallites of the 〈111〉 component have an advantage during both nucleation and growth. Detailed characterization of the microstructural morphology, and estimation of the stored energies in 〈111〉 - and 〈100〉 -oriented regions in deformed and annealed samples, as well as investigations of the growth of recrystallizing grains, are used to analyze the annealing behavior. It is concluded that recrystallization in the given material occurs by a combination of oriented nucleation and oriented growth.

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