Evolution of microstructure and texture in copper during repetitive extrusion-upsetting and subsequent annealing

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The evolution of the microstructure and texture in copper has been studied during repetitive extrusion-upsetting (REU) to a total von Mises strain of 4.7 and during subsequent annealing at different temperatures. It is found that the texture is significantly altered by each deformation pass. A duplex 001 + 111 fiber texture with an increased 111 component is observed after each extrusion pass, whereas the 110 fiber component dominates the texture after each upsetting pass. During REU, the microstructure is refined by deformation-induced boundaries. The average cell size after a total strain of 4.7 is measured to be ~0.3μm. This refined microstructure is unstable at room temperature as is evident from the presence of a small number of recrystallized grains in the deformed matrix. Pronounced recrystallization took place during annealing at 200 °C for 1 h with recrystallized grains developing predominantly in high misorientation regions. At 350 °C the microstructure is fully recrystallized with an average grain size of only 2.3 μm and a very weak crystallographic texture. This REU-processed and subsequently annealed material is considered to be potentially suitable for using as a material for sputtering targets.