STUDIES OF MICROSTRUCTURE IN ANNEALED NANOCRYSTALLINE CHROMIUM BY USING SYNCHROTRON RADIATION DIFFRACTION

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The kinetics of thermal evolution of the microstructure of electrodeposited nanocrystalline chromium (n-Cr) was studied by using several techniques: synchrotron radiation (SR) diffraction at ESRF ID-31 beamline [1] as well as SEM, TEM and EDX. The as-prepared n-Cr samples show the standard bcc crystal structure of Cr [2] with volume-averaged column lengths varying from 25 nm to 30 nm. The grain growth kinetics and the oxidation kinetics were studied by time resolved SR diffraction measurements with n-Cr samples annealed at 400°C, 600°C and 800°C. The most of microstructure changes *e.g.* crystallite size and microstrain fluctuations' decrease, occur within the first 10 minutes of annealing similar to the results of earlier studies [3]. The final crystallite size depends only on the annealing temperature and not on the initial grain size nor on the oxygen content. The final volume-averaged column lengths observed after 50 minutes annealing are: 40 nm, 80 nm and 120 nm for temperatures 400°C, 600°C and 800°C, respectively. The formation of the Cr_2O_3 [4] and CrH [5] phases is observed during annealing. The kinetics of the oxidation process *i.e.* the Cr_2O_3 content increase has been also studied with SR diffraction measrements for n-Cr as well as polycrystalline Cr.

References

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