

Mechanics of materials Hardening by annealing in nanocrystalline PtRu: A further grain size dependent issue

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Severely deformed metals can exhibit a pronounced strengthening during annealing treatments at temperatures below which grain growth occurs. Different explanations for this phenomenon have been introduced with no dominant theory. Within this study this effect has been systematically studied for the first time using nanostructured PtRu alloys, generated by high pressure torsion deformation. The results indicate that hardening upon annealing occurs below a specific threshold grain size. Below this grain size the extent of the hardness increase due to an annealing treatment scales with the grain size. The different possibilities for the hardness increase will be discussed and it will be shown that the results are best explained by recovery phenomena resulting in a change of dislocation generation or/and accommodation of dislocations at the grain boundaries.

Keywords: High pressure torsion, recovery, hardening

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