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EBSD CHARACTERIZATION OF TEXTURE IN TUNGSTEN-RHENIUM FOILS

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Tungsten-rhenium and tungsten foils are used for high-temperature structural applications in lamp and satellite products. The aim of the present paper is to describe the microtexture of W and W-Re alloy foils as a function of Re concentration. Foils of pure W, W-3Re, and W-25Re (compositions in weight percent) were prepared by rolling, swaging and drawing W-Re alloy powder metallurgy ingots in the conventional manner, and then finally rolling the wire to thin foils. All the foils examined possessed a thickness of 0.25mm. The foils were examined in the as-rolled condition and after high-temperature recrystallization. The foils were recrystallized at temperatures up to 2800^{o}C in hydrogen (dew point <-60^{o}C) in a thin-wall vertical tungsten tube furnace. The tungsten tube furnace was resistively heated and its outer temperature was measured using an Ircon two-color pyrometer.

The foils were mounted in plan view and polished to a 0.05μm colloidal silica finish. The foils were examined in the as-rolled and recrystallized conditions. EBSD microtexture data was collected using a CamScan CS44 SEM with the HKL EBSD collection and Channel 4 analysis system. EBSD data was collected at 20kV from 3mmx1mm regions with 5μm steps to provide sufficient grain sampling. Longitudinal samples were also examined to account for surface-center texture gradients.

The microstructures of the recrystallized (2800°C) W and W-25Re foils are shown in orientation maps of the planar sections of the foils in Figures 1(a) and (b). The rolling direction (Y0) and transverse direction (X0) are shown on each image. Pole figures of the same are shown in Figure 2. In the as-rolled condition, a strong a {001}<110> texture was observed in the pure W foil [1, 2], with <110> being almost coincident with the rolling direction. The W foil may possess some residual <110> fiber texture from the as-drawn wire as is typically observed for drawn W [2]. In the as-rolled condition, the W-3Re and W-25Re also possessed {001}<110> textures.

For recrystallized pure W, a texture based on a double texture {100}<011>±16^{o} with rotation about the rolling direction was observed (Figure 2(a)), as has been previously shown by Pugh [1]. In the W-3Re, the recrystallization texture was similar but less pronounced than for recrystallized pure W. In theW-25Re, a weak {111}<110> recrystallization texture was observed, which is different from the textures observed in W and W-3Re foils (Fig. 2(b)). The increased Re in solid solution is mostly likely responsible for the change in recrystallization texture for the W-25Re foil.

References

1. J.W. Pugh, *Trans. AIME*, 212 (5) (1958) 637.
2. C.S. Barrett and T. B. Massalski, *Structure of Metals* , McGraw-Hill, New York, pp. 541-583, 1966.

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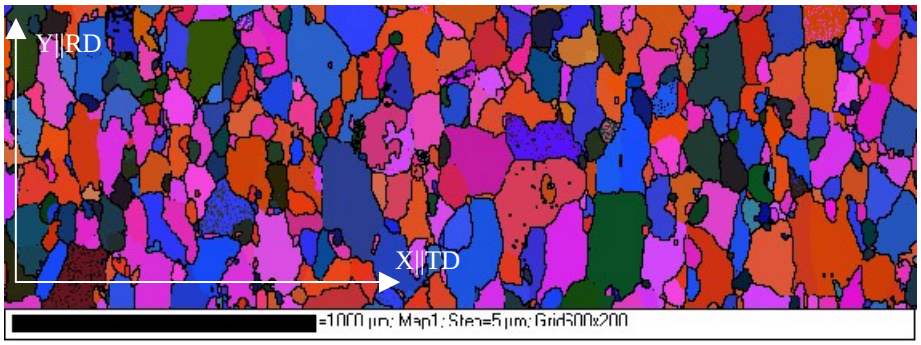
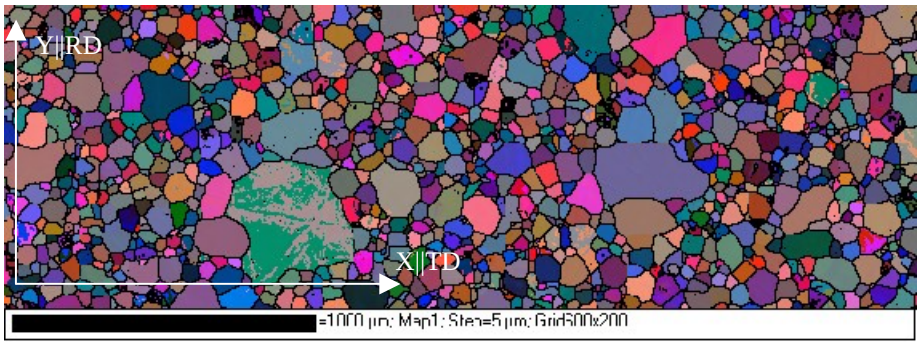
FIG. 1: Euler angle orientation maps of the recrystallized W (a), and W-25%Re (b) foils. The orientation of the micrographs in relation to the rolling direction and the plane of the foil are shown.

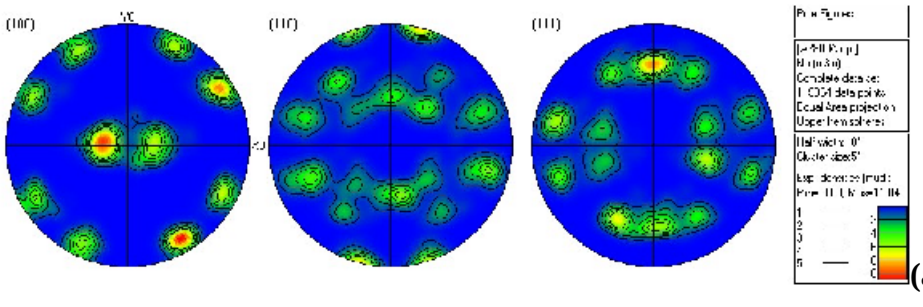


(a)

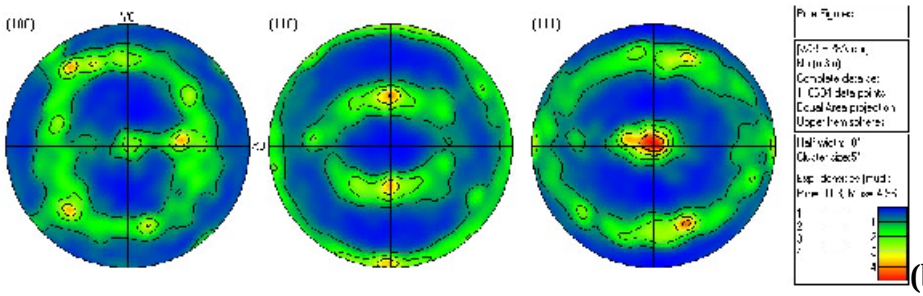


(b)

FIG. 2 : Pole figures for the as-rolled plus recrystallized W (a) and W-25Re (b) foils.



(a)



(b)

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