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Effect of ultrasound on silver electrodeposition: crystalline structure modification

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Abstract

An attractive possibility for influencing microstructures of electrodeposited coatings, and therefore their properties such as hardness, brightness etc. resides in the use of ultrasound. This method is particularly competitive as it may result in a reduction of chemical use, or even in the complete suppression of chemicals. This paper deals with silver coatings depending strongly on current density, with two main categories identified by X-ray diffraction: one poorly structured and the other following the [110] orientation. It is interesting to note that, while changing from still to mechanically stirred conditions, the value of the current density threshold moves from 2.5 mA cm⁻² to 5 mA cm⁻². When ultrasound is used (575 kHz or 20 kHz), this coating microstructure modification threshold occurs at higher current density values when coatings are produced under sonication, while agitation is kept constant. In both cases, the shift is about 15 mA cm⁻². It is noteworthy that silver electrodeposits elaborated under 20 kHz ultrasound conditions appear to be less oriented than those obtained under high frequency conditions.

Keywords: ultrasound; silver electrodeposition; crystalline structures; equivalent velocity; XRD; EBSD

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