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GROM / Thin films growth and modelling

Effect of the deposition rate on competitive growth between amorphous and crystalline phases in sputtered Zr-Cr thin films

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Abstract content

Here, we report a one-step bottom-up approach to synthesize Zr-Cr thin films at the transition between amorphous and crystalline state, allowing a self-separation of the two phases to occur during deposition. In this work, Zr-Cr thin films were synthesized by magnetron co-sputtering of Zr and Cr targets. It is shown scanning electron microscopy and X-ray diffraction that changing the composition of the film between the amorphous and the crystalline compositions enables discovering a competitive self-separation of the two phases, leading to competitive growth between amorphous and crystalline phases. The crystalline phase becomes predominant with increasing thickness, until it covers the whole surface. This process is similar to what we have reported in Zr-W and Zr-Mo systems [1, 2]. Yet, the deposition rate is shown here to change the geometrical characteristics of crystalline regions during growth. This competitive growth enables tuning surface-related functional properties (i.e. surface roughness, reflectivity, wettability, ...) with a one-step process.

References

[1] Borroto et al. Acta Materialia 181 (2019) 78-86 [2] Borroto et al. Applied Surface Science 538 (2021) 148133