Title: Dewetting effect of Ag thin film by new seed layer Zr

Abstract: It was confirmed that the dewetting behavior of Ag/Zr thin films varies significantly depending on the presence of Zr. Ag thin films deposited on MgO (001) substrates rearranged into dot-like structures after heat treatment, and during this process, the Zr layer played an important role in the nucleation and growth rates.

This study confirmed that the dewetting behavior of Ag/Zr thin films varies significantly depending on the presence and thickness of the Zr layer, the amount of Ag deposition, and the annealing conditions. Ag thin films deposited on MgO (001) substrates were rearranged into dot-like structures after heat treatment, during which the Zr layer played a critical role in nucleation and growth rates [1-5].

These findings provide valuable fundamental data for applications involving thermal stability and patterning of thin films. They also suggest that similar approaches.

Specifically, in the absence of Zr (i.e., 10 nm Ag deposited alone), the surface showed relatively high RMS roughness, low coverage, and a high dot density. In contrast, when a 3 nm Zr layer was introduced, RMS and coverage tended to stabilize, which is interpreted as the result of the Zr layer modulating the surface energy and promoting more uniform dot formation. Notably, the combination of 7 nm Ag / 3 nm Zr yielded the highest coverage and dot density, suggesting that the Ag thickness was sufficient and the Zr effectively acted as a diffusion barrier.

However, as this study was conducted under limited sample sets and conditions, follow-up experiments covering a broader range of variables are needed.

These findings provide valuable fundamental data for applications involving thermal stability and patterning of thin films. They also suggest that similar approaches may be applicable to various other metal/interface combinations. Furthermore, the results demonstrate how the presence of a thin layer such as Zr can control surface behavior, indicating potential applications in nanoscale thin film structure control and materials engineering.
However, as this study was conducted under limited sample sets and conditions, follow-up experiments covering a broader range of variables are needed. Future work should include advanced analysis techniques such as TEM and XPS to elucidate mechanisms at the atomic structure level.

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