Nanoimprinting with amorphous metals

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Presentation

Abstract: The random structure in amorphous metals (AM) is homogeneous down to the atomic length scale and results in highest strength and hardness, combined with other attractive properties as a structural material. Even more unique is the softening behavior of AM; they can be considered high strength metals that can be processed like plastics. Recently, we showed that some AM can massively replicate features as small as ~10 nm through direct embossing by utilizing favorable wetting conditions between the AM and the mold material [1]. The unique softening behavior in combination with a wider range of softening temperatures, which span a range of 50°C-500°C among AM provides a versatile toolbox for nanoimprinting. This includes the ability to use AM as a hard mold or, alternatively, a soft imprint material. This toolbox can be used for example in nanoimprint lithography where the robust AM would replace the fragile Si mold in the imprinting process. The low softening temperature of AM and the associate low strength permits to directly write onto the AM as in nano probe lithography. Furthermore, the ability to erase multiple times (10^3-10^4 times) features through the action of the surface tension alone before crystallization sets in [2], can be combined with direct writing and used for high density data storage.

1. G. Kumar, H.X. Tang, and J. Schroers, *Nanomoulding with amorphous metals.* Nature, 2009. **457**(7231): p. 868-U128.
2. G. Kumar and J. Schroers, *Write and erase mechanisms for bulk metallic glass.* Applied Physics Letters, 2008. **92**(3): p. -.