Metastable alloys of completely immiscible Ag-refractory metal systems

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<u>Abstract:</u> Metastable (amorphous, nanocrystalline) materials exhibit special properties of interest for the various technological applications. A direct technique for their preparation is the thermodynamically nonequilibrium process of magnetrons sputtering. Of course, their thermal stability is essential for any application. In this talk our laboratory preparation of several classes of sputter-deposited materials (nc-Ni, Al- and Ag-based alloys with refractory metals) will be described and their properties reviewed.

The effects of phase composition of nc-Ni thin films upon their catalytic activity (hydrogen evolution reaction) are quite pronounced. It was found that the catalytic activity correlates well with the change of the ratio between the nanocrystalline and non-homogeneus disorder part of the nc-Ni film, which can be controlled by substrate temperature during deposition.

Sputter deposited thin films of Al-refractory metals binary alloys are amorphous in a wide range of composition. Their remarkable thermal stability (up to 600°C for Al-W) makes them good candidates for diffusion barriers and anticorrosion coatings at elevated temperatures.

Finally, a completely immiscible Ag-(Nb,Mo,Ta,W) binary systems have been prepared by magnetron codeposition, and their "phase diagrams" experimentally determined for the first time. Nanocrystalline phases are obtained in a quite wide composition range, and their potential for catalysis is currently evaluated.

These are only few examples of new metastable materials prepared and extensively investigated in Zagreb.