

DSCM P51 RELAXATION PARAMETERS OF Cu/SUBSTRATE COATED SYSTEMS

D.Z. Grabco, C.M. Pyrtsac, O.A. Shikimaka
 Institute of Applied Physics, Chisinau, Republic of Moldova;
 *E-mail: grabco@phys.asm.md

In recent years, special attention has been paid to the development and fabrication of new materials, in particular to the coated systems (CS) [1, 2]. From a practical point of view, the relaxation processes under nanoindentation in the film/substrate CS are of a major interest and are studied in present paper. These parameters need to be considered in lithographic technologies that use printing (penetration of resist-marking with a nanometric scale model), recording and storing information by nanoindentation methods in nanomechanical systems. The parameters characterizing the elasto-plastic recovery, h_{e-p} , and the residual plastic deformation, h_{res} , are presented in Fig. 1 in dependence on the applied load for a set of CS, namely: Cu/LiF (soft-on-soft, SS), Cu/MgO, Cu/Si (soft-on-hard, SH) and for the bulk materials (Cu, LiF, MgO and Si).

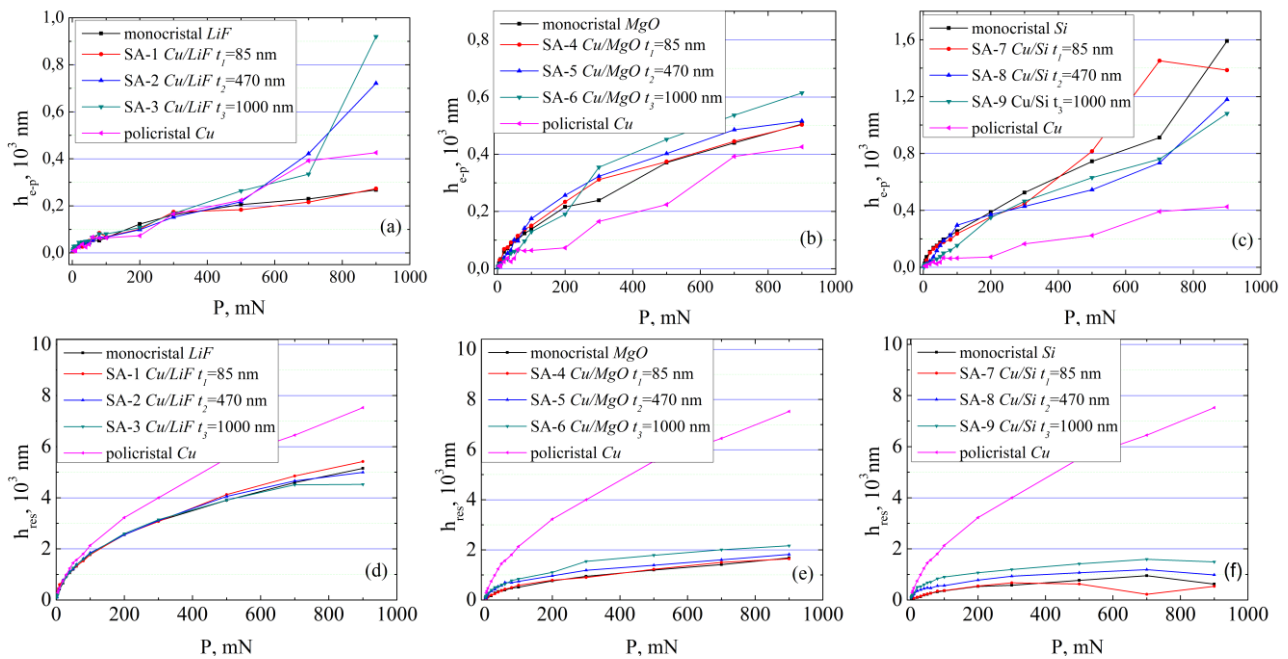


Fig. 1. Dependence of the parameters characterizing the elasto-plastic (h_{e-p}) recovery and the residual plastic deformation (h_{res}) after the indenter extraction vs load (P) of the CS and the bulk crystals used as the substrate

It can be seen that the h_{e-p} parameters change depending on the CS type and the thickness of the film. In the SS type of CS, the residual depth h_{res} is virtually similar to all dependencies besides the polycrystalline Cu (Fig. 1d), whereas the elasto-plastic recovery h_{e-p} (Fig. 1a) only at low and medium loads up to $P \approx 400$ mN is equal to all samples. At high loads h_{e-p} increases for CS compared to Cu and LiF. The difference is also evident in the SH coated systems. The deviation of the Cu curve from the other curves is observed for both parameters even from the smallest loads: the minimal elasto-plastic recovery (Fig. 1b, c) and the highest residual depth (Fig. 1e, f). The h_{e-p} and h_{res} curves are close to those of the crystal-substrate, thereby exhibiting the visible influence of the substrate on the mechanical behavior of the soft-on-hard type CS.

- [1] J. Musil. Surface & Coating Technology. 2000,125, 322-330
- [2] Ю. И. Головин. Введение в нанотехнику. Москва: Машиностроение, 2007, 496 с.