

## Lubrication of DLC coatings by environmentally friendly lubricants

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In this work, the friction and wear behaviour of a-C:H, ta-C and ta-C:H coatings was investigated in presence of GMO, glycerol and oleic acid as lubricants. The effect of contact pressure, temperature and sliding speed was studied using different tribometers in order to evaluate the performance of the system under different regimes of lubrication (EHL, mixed and boundary). The influence of the roughness of the DLC coatings was also investigated by using very smooth ta-C obtained with filtered PVD deposition. Moreover we used deuterated oleic acid for a better detection of the different tribochemical species by ToF-SIMS analysis.

Results show that GMO, glycerol, oleic acid (more generally unsaturated fatty acids), are very effective to lubricate carbon coatings over different sliding speeds and tribological conditions. Generally, ta-C coatings gave better friction reduction than a-C:H for a similar surface roughness. In some tribological conditions, superlow friction was attained (friction coefficient below 0.01). After friction, ToF-SIMS analyses showed an increase of the presence of 2H and O2H inside the wear tracks.

The mechanisms of lubrication of DLC by GMO, glycerol and oleic acid are discussed in the light of the different results and analyses obtained.