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Superlubricity – Role of surface texture and graphene-based coatings under colloidal lubrication: Focus on hypericin

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Achieving superlubricity, i.e. friction coefficient below 1%, in a sustainable way under severe sliding and sliding/rolling operating conditions is considered as a graal in tribology field[1]. The severe conditions can be obtained, among others, by a low velocity of the relative motion between the contacting surfaces or by high pressure of contact. Therefore, the goal of this work is the development of new tribo-systems enable to shift the Stribeck curve towards more severe conditions and lower fiction level. To reach such an objective the technological solution proposed is based on two contributions: the static topography and the dynamic topography. The static topography consists of texturing the contacting surfaces of the two counterparts (that are coated with amorphous carbon or not). And the dynamic topography consists of using an appropriate lubricant with micro-colloidal particles or 2D compounds such as hypericin, graphene by pencilling, MoS_2, etc. In order to characterize the tribo-systems, various tribometers are used to measure the friction coefficient. More precisely, some 2D compounds such as hypericin have shown a real advantage in achieving promply superlubricity in glycerol lubricated condition as showed in figure 1 where the performances of steel/SiO_2 tribopair are presented. Several surface characterizations will be performed on worn surfaces via spectroscopic techniques (XPS, EDS, REELS, RAMAN, etc.) and nanoscale imaging (TEM and AFM) to elucidate the underlying superlubricity mechanism and to scale-up to wide conditions.

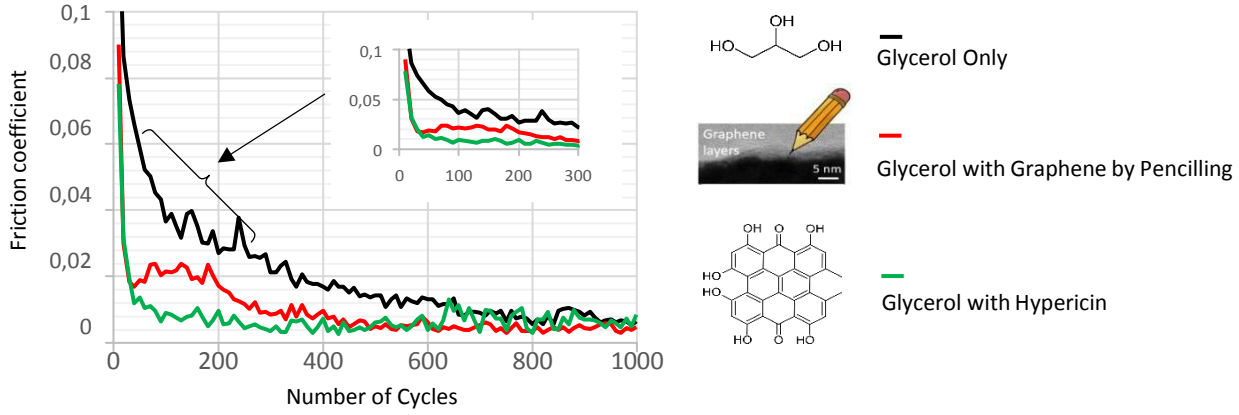

Figure 1. Evolution of the friction coefficient for steel/SiO_2 tribopair lubricated in the presence of glycerol added with 2D compounds or not as function of the cycles number.

References[1] HORIZON-EIC-2021-PATHFINDEROPEN-01, Project number: 101046693, SSLiP: Scaling-up Superlubricity into Persistence https://www.sslip.eu/

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