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H:DLC-W COATINGS IN LUBRICATED TRIBOLOGICAL CONTACT

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C-based coatings with low friction coefficients have been successfully used in a broad range of applications involving dry sliding mechanical contacts. The extension of their application to different components of combustion engines, in order to achieve an optimized low friction behavior in all lubrication regimes, should depend on their interactions with lubrication fluids. However, the inertness and low reactivity of C-based coatings can be an obstacle for the development of an optimized interface, drawback that can be solved by their modification by addition of different metals. The formation of a nanocomposite structure consisting of an amorphous C-rich matrix with dispersed metal or metal carbides nanoparticles can improve the interaction with the lubricant giving rise to the required low friction in all regimes.
In this research, hydrogenated carbon coatings alloyed with low and high W contents were deposited by sputtering in reactive (CH4) atmosphere. The W contents were close to 6 and 11 at.% and the hardness, in both cases, close to 16 GPa. The adhesion of the coatings evaluated by scratch testing critical load was better than 50 N.
The tribological performance was evaluated by sliding and rolling/sliding tests in laboratory tribometers using oils with different additive packages as lubricants. The coatings showed good durability (i.e. no delamination) and very low wear. There was evidence of tribochemical activity in both rolling/sliding and sliding contacts. In this paper the chemical nature of the surfaces and its link to the friction performance is discussed.

Keywords
W-DLC
Lubrication
Wear
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