

Scanning Electron Microscopy and Raman Microscopy investigations of the transformations of fluorinated graphites under friction

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Graphite is extensively used in lubrication industry as wear and friction reducer. It can be used pure, as solid lubricant or as additive in lubricating oils or greases.

This work concerns the improvement of tribological properties of graphite by insertion of fluorine atoms in the graphitic structure.

Tribology experiments, carried out on fluorinated graphite, point out an improvement of the tribologic performances as a function of fluorine concentration. The best results being obtained for compounds fluorinated above 500°C. These compounds always present a lamellar structure whereas the graphene structure (aromatics groups) of the basal plane has been replaced by a chair type structure where each carbon atom will be covalently bonded to a fluorine atom.

The long term efficiency of these compounds is strongly related to the existence of a tribologic (antiwear) film obtained by physical and chemical transformations of the original fluorinated compound under the physical conditions of the sliding contact (pressure, 1.5 Gpa, shearing, 10^5 s^{-1}). In this paper Analytical scanning Electron Microscopy and Raman Microscopy are used in order to characterize the chemical and structural evolution of Fluorinated material under friction. These techniques allowed us to point out that during the friction experiment, fluorinated material undergoes a densification, lose fluorine and finally leads to a final tribological layer presenting a partially graphitized and organized structure. These structural characteristics are probably at the origin of the good tribological properties of the antiwear film.

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