Influence of the structural characteristics of IF-MoS_2 nanoparticles on their lubrication mechanisms

I. Lahouij*, B. Vacher and F. Dassenoy

Laboratoire de Tribologie et Dynamique des Systèmes, Ecole Centrale de Lyon, 69134 Ecully, France.

*Corresponding author: imen.lahouij@ec-lyon.fr

1. Introduction

Inorganic fullerene-like (IF) nanoparticles have received increasing attention in tribology applications as new generation of friction modifier and anti-wear additives in lubricating oil [1,2]. Their efficiency when they are dispersed in oil is related to their lubrication mechanisms which depend on experimental conditions and intrinsic properties of the nanoparticles. The goal of this work is to investigate the lubricating properties of two different types of MoS_2 nanoparticles synthetized by two different methods (namely 'perfectly crystallized' and 'poorly crystallized' particles). The perfectly crystalline IF-MoS_2 nanoparticles prepared by gas phase reaction using a quartz made reactor [3] have a perfect structure without any defect and a high crystalline order presenting more 30 closed shells (Fig.1).

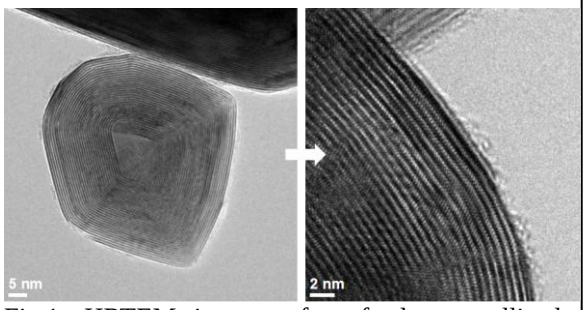

Fig.1: HRTEM images of perfectly crystallized IF-MoS_2

The poorly crystallized IF-MoS_2 synthetized by organic chemical vapor deposition (MOCVD) [4] contain a considerable amount of point defects proving their nearly amorphous character (called poorly crystalline IF) (Fig.2).

The particles were tested in the same conditions c.a. in dispersion in oil and in boundary lubrication regime. A detailed post mortem characterization on wear debris and tribofilms was performed in order to clearly identify the lubrication mechanism of each of these two systems and to rely the action modes of the particles during friction process to their structural characteristics.

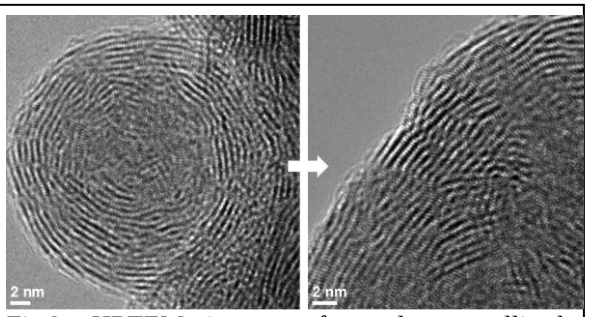

Fig.2: HRTEM images of poorly crystallized IF-MoS_2

2. References

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