

# **EELS Investigation of intercalant Charge Transfer in Intercalated TiS<sub>2</sub> Compounds: Correlation to their Friction Properties**

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**keywords: lamellar compounds, tribology, EELS**

Some lamellar compounds such as graphite, hexagonal boron nitride, molybdenum disulfide...are well known as solid lubricants. Their lubricant properties are mainly attributed to the presence, in their structure, of a Van der Waals gap through which weak bonding occurs between the basal planes leading to an easy sliding in the direction parallel to the basal planes.

Due to the presence of the Van der Waals gap, lamellar compounds can intercalate various species (organic, mineral). Depending on the electronegativity of the intercalated species, charge transfers can occur between the intercalated element and the host structure. This can significantly modify the electronic structure and then the physical properties of the resulting compound.

The charge transfers can significantly affect the electron energy loss spectra inducing variation of energy position of the edges, modification of white line splitting... [1-2]

This work is concerned with the family of TiS<sub>2</sub> intercalated compounds.

Charge transfers are evidenced using transmission Electron Energy Loss Spectroscopy (EELS) either by ionisation edges displacements or white line modifications (energy splitting, L<sub>3</sub>/L<sub>2</sub> intensity ratio).

Some band structure calculations (LMTO-ASA) are done in order to explain the effects of the charge transfer on the EEL Spectra. A linear relationship is evidenced between energy splitting of the L<sub>3</sub> white line and the charge transfers.

Tribological properties of the TiS<sub>2</sub> intercalated compounds are investigated by means of a sphere on plane tribometer. The solid lubricant layers are deposited using the burnishing method. Experiments are carried out under air and controlled atmosphere (Argon)

The tribological properties of the compounds are then correlated to the EELS results.

## **ACKNOWLEDGEMENTS**

The authors acknowledge the Conseil Régional de la Guadeloupe and the Fond Social Européen for their financial supports.

[1] R.D. Leapman, L.A. Grunes and P.L. Feyes, Phys.Rev. B, n°26, p.614 (1982)

[2] P. Leone, J.L. Mansot, J. Wéry, P. Euzen and P. Palvadeau, Microsc., Microa., Microstruc, n°5, p.79 (1994)