

Frictional Behavior of Soft Bi₂S₃ Coatings: Experimental Results and DFT Modeling

CATEGORY OR KEYWORDS

Materials tribology – Solid lubricants and coatings

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ABSTRACT

In harsh environments, solid lubricants are the often best choice in order to reduce friction and wear, thanks to their resistance to high temperatures and contact pressures.

For this purpose, traditional solid lubricants, such as graphite and molybdenum disulfide (MoS₂) have been extensively used. However, all of them show weaknesses in some aspects. For example, graphite needs moist air, while MoS₂ requires high contact pressures in order to properly lubricate [1].

Bismuth trisulfide (Bi₂S₃) is a promising solid lubricant candidate that has not been extensively studied to date [2].

The aim of this study was to analyze the frictional behavior of a Bi₂S₃ based soft coating under variable relative humidity (RH) atmospheres and contact pressures. In addition, its performance was compared to a MoS₂ coating produced by the same method.

The interactions between the Bi₂S₃ coating and the steel substrate were modelled using Density Functional Theory models.

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