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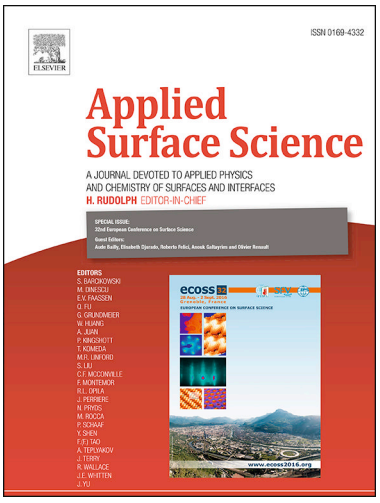

Full Length Article

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PII: S0169-4332(18)30995-4
DOI: https://doi.org/10.1016/j.apsusc.2018.04.041
Reference: APSUSC 39040

To appear in: *Applied Surface Science*

Received Date: 30 December 2017
Revised Date: 24 March 2018
Accepted Date: 5 April 2018

Please cite this article as: X. Dai, M. Wen, K. Huang, X. Wang, L. Yang, J. Wang, K. Zhang, Toward Low Friction in Water for Mo_2N/Ag Coatings by Tailoring the Wettability, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.04.041

Toward Low Friction in Water for Mo_2N/Ag Coatings by Tailoring the Wettability

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Abstract

Increasing demands for robust surfaces in harsh conditions, such as erosion, abrasion and sea-water, has stimulated the development of self-lubricated protective coatings. Meanwhile, due to the oil crisis, research in water lubrication again attracts much attention from both academics and practical engineers. Here, a higher hydrophilicity accompanying with a remarkable drop of friction coefficient in water environment was achieved successfully in Mo_2N/Ag coatings by increasing Ag content. To do these, the Mo_2N/Ag coatings with different Ag content were deposited by co-sputtering, which exhibit a nanocomposite structure consisting of precipitate Ag embedded in the Mo_2N matrix. The high hydrophilicity can be ascribed to the combined contributions of the partial oxidation of Mo_2N and high polarity of Ag precipitates. The decrease of friction coefficient is illustrated by the colloidal friction products and a mode with electric double layer. In which, enhanced hydrophilicity will result in forming a thin "water film" layer between the interface of counterpart and the coatings. And the MoO_x/$Ag_2Mo_4O_{13}$ derived from the hydrolysis action of Mo_2N/Ag sliding in water could function as lubricant phase. Meanwhile, these negative charged MoO_x/$Ag_2Mo_4O_{13}$ colloidal particles induce the rearrangement of positive ions in the "water film" and form an electric double layer, which also contributes to the decrease of friction coefficient.

Key words: Mo_2N/Ag coatings; sputter magnetron; wettability; hydrophilicity; friction coefficient

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