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Dry to touch lubricant graphene as new paradigm in lubrication

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Global lubricant market in 2020 was around 126 billion \$ (1). Despite the maturity of the market, numerous innovations are directed to the reduction of harmful carbon emissions and to the enhancement of efficiency performance. In Europe, eco-labeling norms and increasing use of environmentally friendly oils is a key driving force towards the growth. In this context, solid dry lubricants represent a small percentage of the market but are gaining wider acceptance as improvements in performance and lifetime are being achieved. Such materials are non-toxic and usually they do not require a costly relubrication system, cost of lubrication/cooling systems vary from 7 to 20% of the total manufacturing cost, compared to only 4 to 7% of the utensil costs. Compared to oil or grease lubricants, solid dry lubricants maintain low COFs even in severe contact conditions, such as high temperature, high pressure or aggressive chemicals. The uses are expected to further increase in coming years, mainly because the operating conditions of future tribosystems are becoming more demanding and liquid and grease-type lubricants are undesirable due to environmental concerns. They are in fact normally mixed with solvents and primers, which are often laden with VOCs and other potentially toxic components, also the decomposition at temperatures beyond 300 °C making them not a suitable for high temperature application. On top of this, such lubricants percolate in the work environment and during transport as well as leaving the piece dirty especially in very dusty environments. Graphene can play a key role on the transition from oil to dry lubrication system, due to it's astonish lubricant properties even at very low coating thickness.

References

[1] Lubricants Market Size, Share Industry Report, 2021-2028

Figures



Figure 1: Aluminum foil with and without graphene.

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