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Opinion Article

Brief Description on Tribological Components

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ABOUT THE STUDY

Tribological components are described (friction, lubrication, heat transfer) associated with the hot flat rolling process and the cold flat rolling process. Next, those combined effects that lead to roll wear are considered. The cost of improper application of the tribological principle is mentioned. Independent variables that affect the surface quality of rolled products and the efficiency of energy transfer in contact between rolls and strips are defined. The coefficient of friction and the coefficient of friction are displayed. Experimental and analytical methods consider the coefficient of friction and the approaches available to determine the coefficient of friction. The concepts and ideas presented will be tested in several studies.

Lubrication with pure oils and emulsions is being studied. The requirements for well-lubricated contacts are defined. The properties of the lubricant, especially the pressure and temperature sensitivities of viscosity, are examined. This method explains how to measure and calculate the oil film thickness and the heat transfer coefficient is displayed. There will be given experimental and analytical methods to help you make that decision dependence on the process parameters. Subsequently, the combined effect of friction and heat effects at the interface (roll wear) is examination with attention to the industrial and laboratory conditions. This task combines an experimental Atomic Force Microscope (AFM) with a Density Functional Theory (DFT) simulation to study the interface between metals (copper oxide and titanium) and 2D materials (graphene and MoS_2). The combination of AFM and DFT makes it possible to identify interfacial interactions and establishes a correlation between tribological behavior, interfacial charge distribution, and variation in slip potential energy profile along the metal of 2D-material interface. The metal oxides TiO_2 (rutile) and CuO (copper oxide) are chemically adsorbed mainly along the interface with the 2D material. Both metal oxide are (TiO_2 and CuO) the higher friction and adhesion with graphene than MoS_2. The CuO surface was inferred to be copper rich based on comparison with DFT simulations. The interfacial electronic charge distribution and relative energy change were identified to strongly influence sliding and adhesive behavior between oxidized metal and 2D material are contacted considering only electronic effects in the DFT effect. More homogenous interfacial charge distribution and sharing and lower surface energy variation, as found on the MoS_2 surfaces, were identified to lower friction and adhesion. Non-electronic effects not captured by simulations were found to likely dominate interfacial shear strength measurements experimentally. Therefore, MoS_2 should be used in interfacial applications involving TiO_2 and copper rich CuO surfaces requiring lower adhesion and friction.

CONCLUSION

Copper graphite composites that slide back and forth against copper have been studied for friction, wear, and contact resistance. Tribology and electrical evaluation are complemented by surface analysis. The inclusion of graphite in the composite significantly reduces the coefficient of friction and the coefficient of wear. However, the amount of graphite is not important and has only a small effect on friction and wear. In pure mechanical testing, it is observed that the coefficient of friction is slightly lower and the wear rate is slightly higher than in electrical testing. By increasing the proportion of copper in the compound, contact resistance is significantly reduced. Chemical analysis of the friction film formed on the copper surface shows that it is composed of both graphite and Cu_2O. The pair with the highest oxide content in the friction film also has the lowest contact resistance. It can be concluded that oxides are not always detrimental to contact resistance as long as non-oxidized copper is available.

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