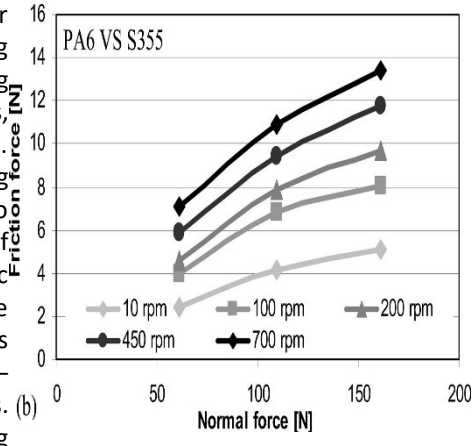
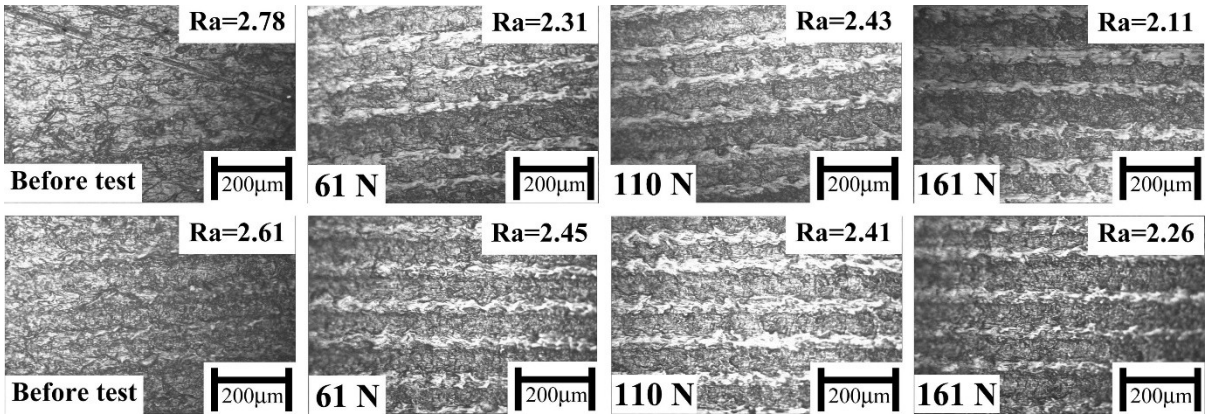
Polimer tribology



(b)

Industries are adapting to the use of polymers as an alternative for metals. At present, the use of polymers in place of rolling–sliding contacts has increased due to its ability to work in dry running conditions. Some of these applications include elevators, escalators, conveyers, chain tension rails, and sliding bearings in swivel chairs. Roll–slip is a commonly occurring mechanism in engineering applications where cams, gears, wheels, and bearings are used. No standardized experimental methods are available for testing of polymer–metal roll–slip contact. However, testing using a twin-disc setup for roll–slip has been adopted by several researchers. The influence of temperature and transfer film is evident from the tests performed. The viscoelastic behavior of polymers enhances rolling–sliding resistance caused by inelastic deformation and hysteresis loss. Considering the different kinds of polymers in engineering applications, polyamide (PA) has been found to have the best frictional behavior. In addition to polymer type, parameters such as load, velocity, slip ratio, and contact surface govern the friction behavior during roll–slip. At higher speeds the polymer tends to become heated rapidly due to the surface and thermal properties of the material. In polymer–metal contacts, the formation of a thin transfer film is an important factor that controls the friction forces in the contact surface. The counter surface material has an important role in determining the mechanisms involved. Two important mechanisms in roll–slip contacts are adhesion and plastic deformation. In a polymer–metal contact it is obvious that sliding causes ploughing on the polymer surface by plastic deformation, where adhesion is governed by rolling.



These two mechanisms are additive, creating an overall friction that also relies on the surface properties of the counter material. The friction behavior of polymer–metal contacts depends on the transfer film formed on the counter material. The selection of counter material is based on the property of development of the thin film and sustaining the film during contacts, which in turn affects the frictional behavior. In addition to the counter material, the formation of a thin film depends upon the properties of the polymer; a soft material tends to form a better transfer layer.

Recent publications on the topic:

1. Sukumaran J, Ando M, De Baets P, Rodriguez V, Szabadi L, Kalacska G, Paepegem V: Modelling gear contact with twin-disc setup. TRIBOLOGY INTERNATIONAL 49: pp. 1-7. (2012) IF: 1.536
2. M ANDO, J SUKUMARAN: Effect on Friction for Different Parameters in Roll–Slip of Polyamide–Steel Nonconformal Contacts. TRIBOLOGY TRANSACTIONS 55:(1) pp. 109-116. (2012) IF: 0.914
3. Sukumaran J, Soleimani S, De Baets P, Rodriguez V, Douterloigne K, Philips W, Andó Mátyás: High-speed imaging for online micrographs of polymer composites in tribological investigation. WEAR 296:(1-2) pp. 702-712. (2012) IF: 1.262