

Photo lubrication: Radiation-induced, reversible and irreversible modification of friction and adhesion

Field of application

For many technical components it is essential that friction and adhesion can be adjusted in a highly precise and reproducible manner, which is traditionally achieved by using appropriate surfaces and/or lubricants.

Funded by the Baden-Württemberg Stiftung gGmbH, KIT (Karlsruhe Institute of Technology) and Ulm University scientists have developed a procedure that allows friction and adhesion properties of surfaces to be modified specifically through irradiation with light.

This opens up completely new possibilities for a wide variety of areas, such as micro- and nanosystems technology. Examples of applications include braking or releasing bearings and photomodulated mechanical couplings, influencing the viscosity of lubricants during operation or a sorting system in which different objects can be automatically assembled by adhesion to the contact surfaces or selectively sorted out by light pulses.

State of the art

What conventional processes do not achieve is a specific adjustment or correction of the coefficient of friction during operation (tailor-made friction or tailor-made lubrication), or a time- or location-dependent change of the interface properties during a running process.

Innovation

The researchers have now created switchable interfaces by coating them with functional groups that react spontaneously to light of a certain wavelength, for example, with a change in configuration. At a certain point in time, it is then possible to irradiate at precisely definable points, thus achieving a local or even extensive change in the friction and adhesion properties. Depending on the coating material and wavelength used, the change may be irreversible or reversible (separation or switching of functional groups). Coefficient of friction and adhesive force can be manipulated together or separately, depending on the material used.

Patent portfolio

Patents granted in CH, DE, FR and GB (EP 1 915 565 A1), in Japan (JP 2009-505084), Canada (CA 2 617 713 A1) and in the US (US 2008/0312109 A1).

Your benefits at a glance

- ✓ Time dependent local modification of friction and adhesion properties
- ✓ Stimulation via electron radiation or electromagnetic radiation, e.g. visible, ultraviolet or infrared light
- ✓ Friction and adhesion properties can be set individually (irreversible or reversible)
- ✓ Friction and adhesion can be controlled and adjusted during the process

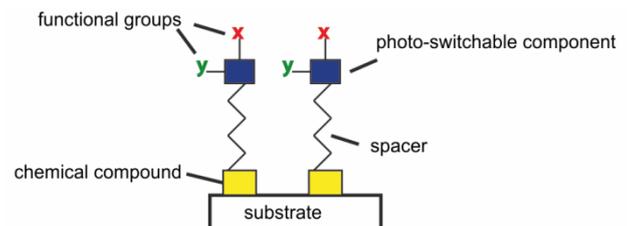


Figure: Schematic representation of the photo-switchable molecules used (Prof. Dr. Schimmel, KIT).

Technology transfer

Technologie-Lizenz-Büro GmbH is responsible for the exploitation of this technology and assists companies in obtaining licenses.

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