What's hot in novel materials R&D?

Friction on the nano-scale by Jason King, MatOx Ltd

A particularly hot topic in materials discovery research is materials having advanced frictional properties. The potential industrial demand is immense, with estimates suggesting that approximately 25 % of the energy used in the world is lost through friction, and that economic losses owing to mechanical parts becoming worn out are between 1.3 % and 1.6 % of industrialized countries' GDP[1].

A classical example of the relevance of the need for non-uniform friction is skating, which needs extremely high and extremely low friction in different phases of motion - when putting on the brakes or when accelerating. In industrial applications advanced tribological properties are often useful. For instance, in the context of steel rollers in paper machines, lubricants, flow motion, and products experiencing a variety of different environmental or process conditions. The science of tribology is also highly relevant to understanding the wear resistance, important across industry, and the effect of surface properties on dirt pick-up, which is of major interest to the coatings industry.

Historically, the R&D effort focused on frictional properties of materials has been conventional empirical and incremental technical development. In recent years, however, new scientific understanding and advancements in computational modeling methodologies have enabled scientists to investigate friction at the scale it takes place - on the nano-scale. For the first time, it is now possible to study and engineer the frictional properties of materials on the nano-scale which opens the door for the design of entirely new material solutions.

This entirely new view into the old problem of friction is likely to bring about significant technological breakthroughs in many of the application areas mentioned above. For the first time we can envisage designing materials with anisotropic friction (having different frictional properties of materials in different directions), or to be able to control the frictional properties of materials with external control parameters or environmental conditions, such as temperature. Plenty of relevant industrial processes and products can be identified in the fields of mining, aerospace, military, and sports. The full potential on the new insight into friction still remains to be seen.

Due to its in-depth scientific, technological and commercial know-how and extensive network, MatOx Ltd is in a unique position to bridge the gap between academy and industry to develop and commercialize these kinds of breakthrough material solutions to market for its forward-looking industrial partners.

[1] European Network for Industrial Wear Prevention, Action Plan Report, April 2005