



Advances in Polymer Composites' Tribology

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A B S T R A C T

In numerous friction and wear applications, the use of polymers and polymer composites has become state of the art. Nevertheless, further developments are still under way to explore new fields of application for these materials and to tailor their properties under more extreme loading conditions. This presentation describes how to design polymeric composites in order to operate under low friction and low wear against various counterparts. Particular emphasis is focused on special fillers (including spherical nanoparticles), often in combination with classical tribo-fillers (such as carbon fibers, graphite flakes, polytetrafluoroethylene (PTFE) particles), for the tribological improvement of thermoplastics and thermosets. The various positive synergistic effects of nanoparticles that can take place

during the sliding wear process between polymer composites reinforced with conventional fillers and metallic counterparts are discussed in detail. Finally, a set of practical examples particularly demonstrates how these different fillers act in concert. The industrial applications include polymer – metal bushings in Diesel fuel injection pumps of the automotive industry, electrically conductive multifunctional polymer bearings, micro-capsule filled epoxy based composites for lubrication and self-healing under tribological loadings, additive manufacturing of tribo-components, and high temperature resistant coatings for automotive engine pistons, bushings, and anti-sticking molds in plastic processing industries.

GLOBAL COMPOSITES EXPERTS WEBINAR SERIES



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B I O

K. Friedrich graduated in "Manufacturing Technology" at the University of Applied Sciences (Dortmund) and in "Mechanical Engineering" at the Ruhr-University Bochum in Germany. Here, he also earned in 1978 his PhD- Degree in "Materials Science". After industrial experience in the construction of machine elements, he was associated in 1980 as a Visiting Assistant Professor with the Center for Composite Materials, University of Delaware, USA. Funding for this stay as a Feodor Lynen Fellow was received from the Alexander von Humboldt Foundation. Afterwards, i.e. between 1982 and 1990, he worked as a Professor for Polymers and Composites at the Technical University Hamburg-Harburg, Germany.

In August 1990, K. Friedrich became Research Director for Materials Science at the Institute for Composite Materials (IVW), University of Kaiserslautern, Germany. He acts also as a Scientific Board Member of various international journals in the fields of materials science, composites, and tribology. Together with his co-workers he has published more than 900 papers in refereed journals, books and conference proceedings. According to ISIHighlyCited.com, Professor Friedrich is listed since 2001 as a highly cited researcher in materials science. Based on Google Scholar, the number of his citations amounts to 28 533 (up to December 8, 2020), and his present H-index is 91. Further, he is editor of several Elsevier books, e.g. on "Friction and Wear of Polymer Composites", "Application of Fracture Mechanics to Composite Materials", "Advances in Composites Tribology", "Multifunctionality of Polymer Composites" and "Structure and Properties of Additive Manufactured Polymer Components". He holds three honorary professorships from distinguished Chinese universities, and two honorary Dr.-degrees from European institutions. In 2005, Prof. Friedrich was honoured as a World Fellow of the International Committee on Composite Materials (ICCM). Between 2006 and 2007 he spent an International Professorial Fellowship at the University of Sydney, and he worked as a consulting professor for the King Saud University in Saudi Arabia between 2008 and 2013. After his retirement from the director position of IVW, Prof. Friedrich acts as a research consultant for various institutes and industrial companies.