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## Low friction, wear resistant quasicrystalline coatings

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Quasicrystals were discovered in 1982 by Shechtman, Nobel Prize in Chemistry 2011, and have since been the focus of intense research regarding their atomic structure, their properties and potential usefulness. Among the few niches of application that were sorted out so far is the possibility to use them as a low friction counterpart in mechanical devices. Typical friction coefficients pointed out against hard steel is indeed about half that observed with conventional metallic metals or with hard steel sliding against itself. Wear during short pin-on-disk tests is also very much reduced. The intrinsic brittleness of quasicrystals is however very much detrimental to such an application, which could not be implemented on realistic devices. We came however to a totally different issue in recent years when we could show that an appropriately prepared quasicrystalline coating can produce friction as low as 6% against hard steel and sintered tungsten carbide whereas wear is negligible for extremely long pin-on-disk tests (i.e. lasting for at least 5 km), see left hand side of the image. The talk will summarize our findings in this area and show how low friction is related to the specific electronic structure of quasicrystals, which determines their surface energy. An overview on other characteristic application niches of quasicrystals will be given.

### Biography

Jean-Marie Dubois is a director of research emeritus at CNRS, France and a part time scientific adviser at Jozef Stefan Institute in Ljubljana, Slovenia. He has dedicated a large fraction of his research efforts to promoting specific applications of quasicrystalline materials (tribology, adhesion, heat insulation) in parallel to his fundamental studies of the atomic structure, electronic structure and electron transport properties of this new type of aperiodic matter.

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