

Applied surface properties of quasicrystalline materials

Jean-Marie Dubois

(jean-marie.dubois@ijs.si)

Equipe Métallurgie et Surfaces, Institut Jean Lamour, CNRS-Université de Lorraine, Nancy,
France

and

Department for Nanostructured Materials, Jozef Stefan Institute, Ljubljana, Slovenia

Quasicrystals are crystals like others from a thermodynamics point of view. They grow through a peritectic reaction upon cooling a liquid alloy of the appropriate composition. They order on the long distance, giving rise to sharp spots in diffraction experiments. Yet, the ordering scheme is different from the one in normal crystals because translational symmetry does not operate in conventional 3-dim space, but in higher dimensions. As a result, electron transport and more generally transport properties are by essence very different from what they are in classical metals, alloys and intermetallic compounds.

This characteristic leads to very different surface properties compared to normal crystals. The first and most important property is the surface energy, which is found significantly below the values inherent to the metallic constituents. From this on, other properties that are related to the surface energy like solid-solid adhesion and friction are also found much under what they are in normal crystals.

Those properties were studied by the author in collaboration with Prof. Dr Severino Jackson Guedes de Lima and his followers (Danielle, Bruno, Rodinei, and other members of the Rapid Solidification Laboratory of the Federal University of Paraíba). The purpose of the seminar will be to give a rapid account of the most salient results obtained in this frame and which appeared in the articles listed below.

References

1 - Indirect assessment of the surface energy of the Al-Cu-Fe quasicrystal

D. CAVALCANTE-GUEDES de LIMA, T. ANDRADE DOS PASSOS, M.-C. de WEERD, S. KENZARI, R. MEDEIROS GOMES, S.J. GUEDES DE LIMA, J.-M. DUBOIS, *J. Materials Science*, **51** (2016) 4070-4078.

2 - Self-lubricating, low-friction, wear-resistant Al-based quasicrystalline coatings.

B. A. SILVA GUEDES de LIMA, R. MEDEIROS GOMES, S.J. GUEDES de LIMA, D. DRAGOE, M.-G. BARTHES-LABROUSSE, R. KOUITAT-NJIWA, J.M. DUBOIS, *Sci. Techn. Advanced Mat.*, **17-1** (2016) 71-79.

3 - Effect of Oxygen/Fuel Ratio on the Microstructure and Properties of HVOF-Sprayed $Al_{59}Cu_{25.5}Fe_{12.5}B_3$ Quasicrystalline Coatings.

F.R.P. FEITOSA, R.M. GOMES, M.M.R. SILVA, S.J.G. DE LIMA, J.M. DUBOIS, *Surface and Coatings Technology*, **353** (2018) 171-178. DOI: 10.1016/j.surfcoat.2018.08.081.

4 - Investigation of the structural integrity of HVOF-sprayed $Al_{59.2}Cu_{25.5}Fe_{12.3}B_3$ quasicrystalline coatings via active piezoceramic excitation

F. R. P. FEITOSA, C. R. SOUTO, M. F. CUNHA, J. A. L. JUNIOR, J. M. B. SOBRINHO, J.-M. DUBOIS, R. M. GOMES, Submitted to *Applied Surface Science*, September 2018.