

WHAT DOES COMPLEXITY MEAN IN AL-BASED METALLIC ALLOYS?

Jean-Marie Dubois

Institut Jean Lamour, UMR 7198 CNRS Nancy-Université UPV-Metz, Ecole des Mines, Parc de Saurupt, CS14234, F-54042 Nancy

In Al-based intermetallics, the interaction at the Fermi energy (E_F) between electronic states originating from aluminum and from transition elements plays a key role in the stabilization of these compounds. Both experimental and theoretical assessments demonstrate that stability is monitored by the Hume-Rothery interplay between Fermi surface and Brillouin zone on the one hand and on the other hand, sp-d hybridization at E_F , where sp states are basically brought by Al whereas d states essentially belong to the transition element. With a view at trying to understand better the balance between the two types of contributions, the paper will address two essentially different properties, namely friction against steel in vacuum and thermal conductivity, in order to investigate their scaling with the complexity of the lattice in a series of Al-based Complex Metallic Alloys. To this end, a simple index for complexity will be introduced. What complexity means regarding properties and potential applications will be exemplified.