Abstract Submitted to the
IICAM Workshop on Correlated Thermoelectricity
25 - 30 September, 2005
Hvar, Croatia

The transport properties of the phase $\beta - Mg_2Al_3$

Igor Smiljanić[1], Ante Bilušić[2], Željko Bihar[1], Ana Smontara[1]

[1] *Institute of Physics, Bijenička 46, POB 304, HR-10001 Zagreb, Croatia*
[2] *Faculty of Mathematics, Natural Sciences and Education, University of Split, Nikole Tesle 12, HR-21000 Split, Croatia*

The β phases in the magnesium aluminium (the name commonly used $\beta - Mg_2Al_3$) system belongs to a huge group of largely unknown multinary alloys named "complex metallic alloys". In these alloys, phases are formed with crystal structures based on giant unit cells containing many tens, up to more than a thousand atoms per unit cell. This contrasts with conventional alloys whose crystal unit cells in general comprise a few atoms only. Within the huge unit cells, the atoms are arranged in clusters. These clusters strongly influence the electronic structure and the lattice dynamics. As a result, these materials offer unique combinations of properties, which are mutually excluded in conventional materials. Among the still relatively small number of known complex metallic alloys, large crystals of the orthorhombic $\beta - Mg_2Al_3$, with the enormous number of 1168 atoms per unit cell, were grown recently. Here we present the first study of their transport properties (electrical resistivity, thermopower and thermal conductivity). The results, that are in many respects different from both regular, periodic metals and alloys and quasicrystals indicate that the transport properties of the $\beta - Mg_2Al_3$ are affected by both the quasiperiodic short-range atomic order and the long-range periodic order.

Keywords : complex metallic alloys, transport properties