Geophysical Research Abstracts, Vol. 7, 08485, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08485

Structure of Fe-Ni and Fe-Ni-S molten alloys by neutron diffraction

G. J. Cuello (1), R. Fernández-Perea (2), F. J. Bermejo (3), G. Román-Ross (4), J. Campo (5)

(1) Institut Laue Langevin, 6 rue Jules Horowitz, BP 156, F-38042 Grenoble Cedex 9, France, phone: +33 476 207697, fax: +33 476 207648, e-mail : cuello@ill.fr

(2) Instituto de Estructura de la Materia, C.S.I.C.
Serrano 123, E-28006 Madrid, Spain

(3) Dept. of Electricity and Electronics, University of the Basque Country, Box 644, E-48080 Bilbao, Spain

(4) Laboratoire de Géophysique Interne et Tectonophysique, Maison de Géosciences, UJF-CNRS, BP 53, F-38041 Grenoble Cedex 9, France

(5) Instituto de Ciencia de Materiales de Aragón, C.S.I.C.-Universidad de Zaragoza
E-50009 Zaragoza, Spain

Recently, an anomaly in the sound velocity has been observed in molten alloys supposed to be in several planetary cores. These are mainly FeNi alloys with a proportion of some light element, which explains the low observed density. In these alloys, the sound velocity increases with temperature, exactly the opposite behaviour that is expected in normal metallic alloys. One of the possible candidates to be such light element is sulphur, and one plausible hypothesis explaining the observed anomaly in the sound propagation is the formation of FeS clusters in the molten alloy. Increasing the temperature of the liquid, such clusters could be disaggregated favorising the sound propagation. In this paper the static $S(Q)$ liquid structure factors for binary Fe_xNi_{1-x}, x= 0.90, 0.85 and ternary $Fe_{0.85}Ni_{0.05}S_{0.15}$ molten alloys are investigated by means of the concurrent use of neutron diffraction and Reverse-Monte-Carlo simulations. The measured $G(r)$ radial distributions reveal atomic orderings varying from that present

in the $Fe_{0.90}Ni_{0.10}$ alloy, reminiscent of the ideal b.c.c. structure of solid Fe, to a far more open structure found in $Fe_{0.85}Ni_{0.05}S_{0.15}$. From data at hand no clear evidence of clustering of sulphur within the Fe-Ni matrix is found, but in contrast, its addition leads to significant changes in structural properties.