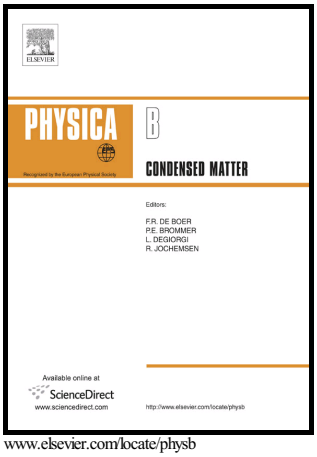
Theoretical prediction of thermodynamic activities of liquid Au-Sn-X (X = Bi, Sb, Zn) solder systems

O.E. Awe, O.M. Oshakuade



www.elsevier.com/locate/physb

PII: S0921-4526(16)30566-X
DOI: http://dx.doi.org/10.1016/j.physb.2016.11.035
Reference: PHYSB309739

To appear in: *Physica B: Physics of Condensed Matter*

Received date: 2 November 2016
Accepted date: 29 November 2016

Cite this article as: O.E. Awe and O.M. Oshakuade, Theoretical prediction o thermodynamic activities of liquid Au-Sn-X (X = Bi, Sb, Zn) solder systems *Physica B: Physics of Condensed Matte* http://dx.doi.org/10.1016/j.physb.2016.11.035

Theoretical prediction of thermodynamic activities of liquid Au-Sn-X (X = Bi, Sb, Zn) solder systems

O.E. Awe[1,2*], O.M. Oshakuade[1]

[1]Department of Physics, University of Ibadan, Ibadan, Nigeria.

[2]Department of Physics and Engineering Physics, Obafemi Awolowo University,Ile-Ife, Nigeria.

[*]Corresponding author. Tel.: +2348055359532; draweoe2004@yahoo.com

Abstract

Molecular interaction volume model has been theoretically used to predict the thermodynamic activities of tin in Au-Sn-Bi and Au-Sn-Sb and the thermodynamic activity of zinc in Au-Sn-Zn at experimental temperatures 800K, 873K and 973K, respectively. On the premise of agreement between the predicted and experimental values, we predicted the activities of the remaining two components in each of the three systems. This prediction was extended from three cross-sections to five cross-sections, and to temperature range 400-600K, relevant for applications. Iso-activities were plotted. Results show that addition of tin reduces the tendency for chemical short range order in both Au-Sb and Au-Zn systems, while addition of gold and bismuth, respectively, reduce the tendency for chemical short range order in Sn-Sb and Au-Sn systems. Also, we found that, in the desired high-temperature region for applications, while a combination of chemical order and miscibility of components exist in both Au-Sn-Bi and Au-Sn-Zn systems, only chemical order exist in the Au-Sn-Sb