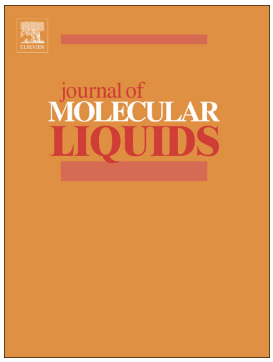

The thermophysical properties of eutectic Ga-Sn-Zn with In additions

A. Dobosz, Yu. Plevachuk, V. Sklyarchuk, B. Sokoliuk, O. Tkach, T. Gancarz

PII: S0167-7322(18)33403-2
DOI: doi:10.1016/j.molliq.2018.09.006
Reference: MOLLIQ 9612

To appear in: *Journal of Molecular Liquids*

Received date: 3 July 2018
Revised date: 20 August 2018
Accepted date: 2 September 2018

Please cite this article as: A. Dobosz, Yu. Plevachuk, V. Sklyarchuk, B. Sokoliuk, O. Tkach, T. Gancarz , The thermophysical properties of eutectic Ga-Sn-Zn with In additions. Molliq (2018), doi:10.1016/j.molliq.2018.09.006

The thermophysical properties of eutectic Ga-Sn-Zn with In additions

A. Dobosz[1], Yu. Plevachuk[2], V. Sklyarchuk [2], B. Sokoliuk[2], O. Tkach[2], T. Gancarz[1,#]

[1] *Institute of Metallurgy and Materials Science, Polish Academy of Sciences, Krakow, Poland*

[2] *Department of Metal Physics, Ivan Franko National University of Lviv, Lviv, 79005 Ukraine*

contact: tomasz.gancarz@imim.pl,

Abstract

The proposed Ga-Sn-Zn-In liquid alloys could be applied not only in the increasing number of sensors which control devices and help in our daily lives, but also in thermal management systems. The aim of this study is to determine the thermophysical properties of liquid eutectic Ga-Sn-Zn with In additions of 1.0, 5.0, 10.0, 15.0 and 21.4 (wt %). The density and viscosity increases with higher In content in Ga-Sn-Zn-In alloys, and at the same time surface tension and electrical conductivity decreases. According to thermal conductivity and thermoelectric power the obtained experimental results for 1.0 In are higher compare to eutectic Ga-Sn-Zn, and with increasing In content are also decreasing.

Keywords: electrical conductivity, thermoelectric power, thermal conductivity, density, surface tension, viscosity

Introduction

The development of liquid metal alloys which remain liquid at room temperature finds applications in microfluidics [1] and sensors [2] for controlling devices and protecting life. Possibilities include the application of microfluidics for molecular analysis, biodefence, molecular biology and microelectronics [3], and indeed there has been rapid development in this field in terms of fabrication of components – the microchannels that serve as pipes, and other structures using microfluidic injection or photolithography and associated technologies, which are commonly used for liquid metal patterning due to simplicity, high resolution, and repeatability [4-7]. Liquid metal alloys also show great promise for application in sensors for soft, flexible, stretchable, and even reconfigurable electronics, using processing methods employed to date such as lithography, planar printing, coating, micro-channel moulding, filling, lamination and embedded 3D printing [2, 7-9]. The limitations of resolution printing,