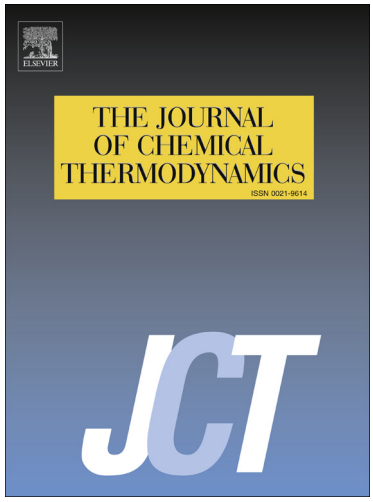


# Thermodynamic investigation of silver-thallium tellurides by emf method with solid electrolyte $Ag_4RbI_5$

N.B. Babanly, E.N. Orujlu, S.Z. Imamaliyeva, Y.A. Yusibov, M.B. Babanly

PII: S0021-9614(18)30342-2
DOI: https://doi.org/10.1016/j.jct.2018.08.012
Reference: YJCHT 5500

To appear in: *J. Chem. Thermodynamics*

Received Date: 5 September 2017
Revised Date: 2 August 2018
Accepted Date: 9 August 2018

Please cite this article as: N.B. Babanly, E.N. Orujlu, S.Z. Imamaliyeva, Y.A. Yusibov, M.B. Babanly, Thermodynamic investigation of silver-thallium tellurides by emf method with solid electrolyte $Ag_4RbI_5$, *J. Chem. Thermodynamics* (2018), doi: https://doi.org/10.1016/j.jct.2018.08.012

# THERMODYNAMIC INVESTIGATION OF SILVER-THALLIUM TELLURIDES BY EMF METHOD WITH SOLID ELECTROLYTE $Ag_4RbI_5$

**N.B.Babanly[a], E.N. Orujlu[b], S.Z.Imamaliyeva[b], Y.A.Yusibov[c], M.B.Babanly,*[b]**

*[a]Baku State University, 23, Z.Khalilov str., Baku, Azerbaijan*

*[b]Institute of Catalysis and Inorganic Chemistry, Azerbaijan National Academy of Sciences, 113, H.Javid ave., Az-1148, Baku, Azerbaijan*

*[c]Ganja State University, 187, H.Aliyev ave., Az-1148, Ganja, Azerbaijan*

*Corresponding author: e-mail:* babanlymb@gmail.com (M.B.Babanly)

The Ag-Tl-Te system was studied using the EMF method with a solid $Ag^+$ conducting electrolyte $Ag_4RbI_5$ in the temperature range 295-450 K. Previously constructed solid phase diagram of this system was confirmed. The partial molar functions ($\Delta\overline{G}, \Delta\overline{H}, \Delta\overline{S}$) of silver in alloys, as well as the standard thermodynamic functions of formation and standard entropies of the $AgTlTe_2$, AgTlTe, $AgTl_3Te_2$, $Ag_8Tl_2Te_5$, $Ag_5TlTe_3$, and $Ag_9TlTe_5$ ternary compounds, were calculated. The received values were compared with the available literature data. The obtained results confirmed the possibility of the thermodynamic study of silver-containing complex systems using this modification of the EMF method, even if they contain a more electropositive metal than silver.

***Keywords:*** silver-thallium tellurides, EMF method, solid electrolyte, $Ag_4RbI_5$, thermodynamic properties.

## 1. Introduction

Electrochemical methods, especially the electromotive force (EMF) method, are widely used for thermodynamic studies of metallic, semiconductor, and other systems. The classic variant of this method with a liquid electrolyte has limitations relating to the occurrence of side processes [1-4]. One of the effective ways to extend the options for application of the EMF method is the use of solid electrolytes [5-9].

Solid electrolytes are characterized by high electrolytic conductivity, low electrical conductivity, stability even in the presence of an electric field, chemical compatibility with reaction products. Moreover, unlike liquid electrolytes, solid electrolytes are materials in which the electric current is carried out by ions of a single element with a strictly defined charge.

These features open a possibility of direct measurement of the activity of the corresponding component in a complex alloy irrespective of the fact whether this element is less noble of the system or not [9].