

# Pt<sub>3</sub>Ga: Thermodynamics and Nonstoichiometry

Agnes Schweitzer<sup>a</sup>, Yongzhang Huang<sup>a,c</sup>, Wenxia Yuan<sup>b</sup>, Zhiyu Qiao<sup>c</sup>, Olga Semenova<sup>a</sup>, Friedrich Gehringer<sup>a</sup>, and Herbert Ipser<sup>a</sup>

<sup>a</sup> Institut für Anorganische Chemie, Universität Wien, A-1090 Wien, Austria

<sup>b</sup> Department of Chemistry, University of Science and Technology Beijing, Beijing 100083, P. R. China

<sup>c</sup> Department of Physical Chemistry, University of Science and Technology Beijing, Beijing 100083, P. R. China

Reprint requests to Prof. Dr. H. Ipser. E-mail: herbert.ipser@univie.ac.at.

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Thermodynamic activities of gallium were measured between about 1000 and 1300 K in the non-stoichiometric intermetallic compound Pt<sub>3</sub>Ga using an emf-method based on an oxygen conducting solid electrolyte. The variation of the lattice parameter with composition was determined by powder X-ray diffraction. The results of the activity measurements are interpreted in terms of a statistical-thermodynamic model for L<sub>12</sub>-phases considering four types of point defects, *i. e.* anti-structure atoms and vacancies on the platinum and gallium substructures. The energies of formation of the point defects at the stoichiometric composition are estimated from a curve fitting procedure yielding  $E_f(\text{Pt}^{\text{Ga}}) = E_f(\text{Ga}^{\text{Pt}}) = 1.25$  eV, assuming that  $E_f(\text{V}^{\text{Pt}}) = E_f(\text{V}^{\text{Ga}}) = 2.0$  eV. This results in a disorder parameter  $\alpha' = 3 \cdot 10^{-6}$  at 1173 K which means that at the stoichiometric composition 0.0012% of the gallium substructure sites are occupied by platinum atoms and 0.0004% of the platinum sites by gallium atoms at this temperature.

**Key words:** Pt<sub>3</sub>Ga: Thermodynamics, Pt<sub>3</sub>Ga: Nonstoichiometry, Thermodynamic Measurements, Statistical-Thermodynamic Model, Platinum-Gallium Alloys