

REASSESSMENT OF THE Ag–Pd SYSTEM

A.S. Pavlenko, E.G. Kabanova, V.N. Kuznetsov
Moscow Lomonosov State University, Russia
a.s.pav@yandex.ru

Alloys of silver and palladium are widely used in industry, f.e. for hydrogen purification, in electrical engineering and in dentistry. Ag and Pd have unlimited solid and liquid solubility [1]. The results of the early assessment [2] proved to be in poor agreement with the later obtained experimental thermodynamic data for the melt and have been revised by [3] using newly published thermodynamic data and their own DSC study.

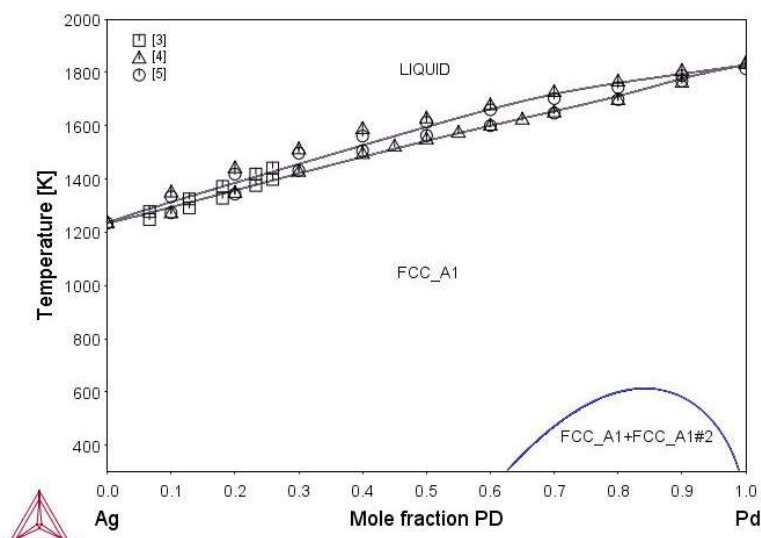


Figure 1. The calculated by [3] diagram of Ag–Pd system.

However, the calculated by [3] diagram of Ag–Pd system exhibit a spurious miscibility gap in fcc phase at low temperatures (Figure 1), which was not noted by the authors. This miscibility gap had not been observed in any experiment and definitely is an artifact of calculation. Moreover, in the calculation of the Ag–In–Pd ternary system such spurious miscibility gaps appeared near the Ag–Pd side already at 723 K.

To get rid of this miscibility gap, new assessment of Ag–Pd binary was performed. Thermodynamic data, obtained recently in the temperature range 400 to 750 K by the EMF method [6], were used both for the choice of the model of fcc phase and for calculation of starting values of parameters of models. The activity and partial Gibbs energy of silver and palladium could be described with good accuracy by a subregular model.

Optimization of the Ag–Pd system was carried out on the PARROT module of Thermo-Calc software. All the experimental data for the Ag–Pd system phases presented in the literature were taken as input data for optimization.

The thermodynamic description of the Ag–Pd system obtained in this paper is in good agreement with the experimental data of phase equilibria and thermodynamic properties of phases and does not show any artifacts.

Acknowledgments The financial support of RFBR, project number 19-33-90204.

- [1] I. Karakaya, W.T. Thompson, *Bull. All. Phase Diagr.*, 1988, 9 (3), 237-243.
- [2] G. Ghosh, C. Kantner, G.B. Olson, *J. Phase Equilibria*, 1999, 20 (3), 295-308.
- [3] J. Sopousek, A. Zemanova, J. Vrestal, P. Broz, *J. Alloys Compd.*, 2010, 504 (2), 431-434.
- [4] E.M. Savitskii, N.L. Pravoverov, *Russ. J. Inorganic Chem.*, 1961, 6, 253-254.
- [5] R. Ruer, *Z. Anorg. Allg. Chem.*, 1906, 51, 315-319.
- [6] D. Feng, P. Taskinen, *J. Mater. Sci.*, 2014, 49(16), 5790-5798.