**Dissertation release 28.07.2014**

**Thermodynamic study for improved metals extraction and functional materials manufacturing**

|  |  |
| --- | --- |
| **Title of the dissertation** | Thermodynamic stabilities of complex phases and their assemblages in Ag-Te, Ag-Bi-S and Ag-Cu-S systems |
| **Contents of the dissertation** | Currently, most of industrial raw materials for valuable metals production are becoming increasingly complex. These complex phase systems essentially include silver-based compounds such as tellurides and sulfosalts. Thus, metal producers are in need of accurate thermochemical data of the complex silver-based phase systems, which will be used in modification of operating flow sheets and outlining strategies for processing the complex feed materials economically and in an environmentally friendly manner. In recent years, the silver-based chalcogenides such as AgBiS2 have also been noted for their unique electronic and magnetic properties. For example, these unique properties can be applied in optoelectronic and thermoelectric devices. Accurate study of the properties of these chalcogenides will also promote improved manufacturing of devices incorporating them. Therefore, thermodynamic data concerning the silver-based chalcogenides determined within this thesis have considerable fundamental and practical importance in many aspects of extractive and physical metallurgy.In this doctoral dissertation, thermodynamic properties of selected silver-based phases have been studied experimentally by an improved Electromotive Force (EMF) method. The traditional EMF method has been improved for better accuracies and to overcome experimental difficulties. State-of-the-art equipment has been utilized and a new philosophy for constructing the galvanic cell and controlling the temperature gradient over the galvanic cell were employed. This improved technique facilitated accurate and new thermodynamic measurements.Several new experimental data have been obtained and, for the first time, the effects of saturation of some substances on thermodynamic properties of the silver-based phases have been determined. The experimental data obtained within this thesis together with the selected literature data enabled the determination of accurate thermodynamic functions for 36 practically interesting equilibrium reactions.  |
| **Field of the dissertation** | Metallurgy |
| **Doctoral candidate** | M.Sc. (Tech.) Fiseha Tesfaye  |
| **Time of the defence**  | 15.8.2014 at 12 noon |
| **Place of the defence** | Aalto University School of Chemical Technology, Department of Materials Science and Engineering, Auditorium V1, Vuorimiehentie 2, Espoo |
| **Opponent** | Professor Boguslaw Zbigniew Onderka, AGH University of Science and Technology, Poland |
| **Supervisor** | Pekka Taskinen, Aalto University School of Chemical Technology, Department of Materials Science and Engineering |
| **Web address of the****dissertation** | <https://aaltodoc.aalto.fi/handle/123456789/13621> |
| **Doctoral candidate’s****contact information** | M.Sc. (Tech.) Fiseha Tesfayefiseha.tesfaye@aalto.fi p. 050 321 1876 |