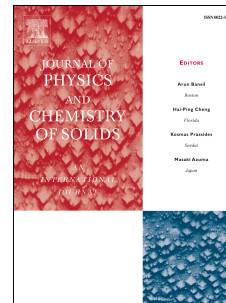


Accepted Manuscript

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PII: S0022-3697(17)31071-5

DOI: [10.1016/j.jpcs.2017.10.003](https://doi.org/10.1016/j.jpcs.2017.10.003)

Reference: PCS 8233

To appear in: *Journal of Physics and Chemistry of Solids*

Received Date: 14 June 2017

Revised Date: 24 August 2017

Accepted Date: 2 October 2017

Please cite this article as: M.H. Bölükdemir, H. Koc, E. Eser, Calculation of thermophysical properties of copper compounds in CuCl production cycle, *Journal of Physics and Chemistry of Solids* (2017), doi: 10.1016/j.jpcs.2017.10.003.

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Calculation of thermophysical properties of copper compounds in CuCl production cycle

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Abstract:

In this study, it is presented a new analytical method to the calculation of thermophysical properties of some solids important in hydrogen production relevant to the Cu–Cl cycle (Cu, CuO, CuCl). In this way we have used the solution of Debye functions is valid for the all temperature regions with aid of statistical thermodynamics. The analytical results have been compared with some experimental and theoretical data, and the results obtained are satisfactory for the wide range temperature variations. Comparison of the calculation results with the other literature data show that our approach is accurate and efficient.

Keywords: Hydrogen production, statistical thermodynamics, heat capacity, thermophysical properties

1. Introduction

Hydrogen is one of important energy sources that have all the properties to be a fuel for hydrogen engines, fuel cells and a future energy source [1, 2]. Hydrogen is also considered as a high efficiency, low polluting fuel that can be used for transportation, heating, and power generation. One of the advantages of hydrogen is that it can store energy from all sources, both renewable, fossil and nuclear power. In contrast to other known energy sources, hydrogen does not contain carbon and therefore it a perfect candidate to the meet the energy needs in the future. At the same time, one of the existing problems in hydrogen technology is to produce cheap hydrogen [1]. Hydrogen can be produced from a number of sources such as water, hydrocarbon fuels, biomass and boron hydrides etc.

There are the different methods used by many researchers to the production of hydrogen [3-17] such as electrolysis, nuclear-based water splitting [7-10], thermochemical water splitting (sulphur-iodine [11-13] and copper-chlorine [1, 13-16], UT-3 cycle etc.).

Electrolysis is a well-known method, and is the separation of water into its components hydrogen and oxygen using electrical current. But, this production method is not widely used due to its very high electricity consumption and hydrogen production efficiencies. The

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