THERMAL EFFECTS OF KINETIC REACTION MODELS DURING HYDROGEN ABSORPTIO IN METAL HYDRIDE TANK

Karim Lahmer[*,§] , Rachid Bessaih[**]

[*,**]Dept. of Mechanical Engineering , LEAP , University of Constantine 1, Algeria.
[§]Correspondence author. Fax: +213 31 91 28 07 Email: lahmer.karim@sde.dz

ABSTRACT This numerical work presents thermal investigation of transient hydrogen solid storage in $MmNi_{4.6}Al_{0.4}$ metal hydride three dimensional tank. Indeed, thanks to its moderate reaction temperatures and pressure, it is considered as among best hydrogen storage material. The laws governing the chemical and thermal phenomena have been determined experimentally. However, computational simulation allows prediction and understanding the spatial and temporal evolution of the hydrogen reactions and participates to saving significant time in the design and optimization of hydrogen tanks. Also, an UDF was implemented to FLUENT and used for simulations. In what follows, we describe the contribution to hydrogen absorption process in metal hydride tank in order to consider a better control of the generated phenomena. Finally, results show that because of great sensitivity to time step values and to the very long calculation time, JMAK model is not appropriate for the hydrogen absorption kinetic reaction modeling.

Keywords: *Hydrogen storage, Metal hydride tank, 3D Geometry, CFD, FLUENT - ANSYS 13.0, Thermal modeling, Reaction kinetic mechanisms.*