# The Analysis of Hydridying and Dehydriding Kinetics

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## ABSTRACT

The kinetics of hydriding and dehydriding (H/D) in hydrogen storage materials are important for practical as well as fundamental reasons. On the one hand, any applications involving the use of hydrogen stored in solid media must consider the rate at which hydrogen gas can be liberated from a storage medium under a given set of temperature and pressure conditions, so that hydrogen fluxes can be adjusted to the requirements of the specific application; in addition, the rate at which the hydrogen charge can be replenished may be a relevant consideration for the intended practical purposes. On the other hand, the analysis of the kinetics may allow to determine the physic-chemical mechanisms controlling the processes of hydrogen uptake by and release from the storage medium; such knowledge, in turn, could be used to the design or discovery of new storage materials with improved properties. With a few exceptions, the kinetic data of (H/D) in solids has been customarily treated with scant consideration to the fact that the storage materials are far from fulfilling the premises set up by well-known transformation or reaction theories (for example, size uniformity), despite the fact that it has been known for a long time that these inconsistencies may well turned irrelevant any conclusions drawn from the kinetics analysis. The present work deals with the kinetics of H/D in magnesium-based materials in order to illustrate the effects on the kinetics analysis of parameters such as particle size, MgO content, and temperature on the results derived from conventional theoretical treatments. The final results are conveyed as a set of guidelines intended to provide a methodology to obtain a better understanding of the actual microstructural evolution during the H/D processes and an improved capacity for modelling the uptake and release of hydrogen in nanostructured, Mg-based materials.

***Keywords:*** hydrogen storage, kinetics analysis, Mg-based alloys