Effective thermal conductivity of multiwalled carbon nanotubes as hydrogen storage materials

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The effective thermal conductivities (ETCs) of pure and Pt decorated multiwalled carbon nanotubes (MWCNTs) as hydrogen storage medium were investigated. For this purpose, compact ETC measurement cell requiring typical sample size of Sievert's volumetric apparatus for the kinetic studies was developed and verified using LaNi5 as a reference material. The measured ETCs of pure MWCNTs were found to be as low as 0.52 W/mK for hydrogen pressure of 40 atm and 25oC due to heat transfer resistance at tube-tube junctions. Although hydrogen uptake of Pt decorated MWCNTs could enhance 10 times more than that of pure MWCNTs, it was revealed that there were no significant differences of the measured ETC values between pure and Pt decorated MWCNTs. This result means that the enhanced hydrogen uptake and metal decoration of MWCNTs can't lead to a significant change for heat transfer of tube-tube junctions. Although more experimental and theoretical work is needed to fully understand this behavior, this work will provide useful information for the development of the CNT admixed composite as hydrogen storage materials.