# Hydrogen Isotope Fractionation in Aqueous Alkaline Earth Chloride Solutions

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The D/H ratio of hydrogen gas in equilibrium with aqueous alkaline earth (Mg, Ca, Sr or Ba) chloride solutions measured at 25 °C using a hydrophobic platinum catalyst, was found to be higher than the D/H ratio equilibrated with the applied pure water. The hydrogen isotope effect between such solutions and pure water changes with the molality of the solutions. The order of the D/H ratios in alkaline earth chlorides is found to be $BaCl_2 > SrCl_2 \geq CaCl_2 \geq MgCl_2$. The hydrogen isotope effect in the aqueous chloride solutions of Mg, Ca, Sr or Ba ions is significantly larger than that in the aqueous chloride solutions of Li, Na, K or Cs ions. For $MgCl_2$ and $CaCl_2$ solutions, the hydrogen isotope effect is opposite to the oxygen isotope effect. The results are compared with the free energy change of transfer from $H_2O$ to $D_2O$, and are discussed for the vapour pressure ratio of $H_2O$ and $D_2O$ of $CaCl_2$ solutions.

*Key words:* Hydrogen Isotopes; Alkaline Earth Chloride; D/H Fractionation; Isotope Effect in Aqueous Salt Solutions; Hydrated Water Molecules.