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Separation of ortho para hydrogen by cryogenic distillation

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Not only the isotopologues of hydrogen can be separated by cryogenic distillation but also the nuclear spin isomers of H₂, D₂ and T₂ (ortho, para). One application of the ortho para distillation is the measurement of the separation performance of a distillation column quantified by the height equivalent of theoretical plates (HETP). Compared to isotope mixtures the relative volatility of the isomers is much smaller than that of different isotopologues and therefore the concentration gradients along a distillation column are way smaller. Therefore, this can be used for high accurate measurement of the HETP of distillation column.

In addition, this also enables to produce high purity ortho or para samples. Typically, only the ground state can be achieved in high purity by cooling down and catalysing. The room temperature equilibrium of 75% ortho H₂ and T₂ (66% para for D₂) can not be exceeded by this procedure, but the application of cryogenic distillation enables the generation of such unique samples. Those samples above the thermal equilibrium come to interest when investigating the fundamental properties like molecular interaction and thermodynamic properties in dependence of the ortho para ratio of H₂, T₂ and D₂.

This contribution shows the current state of simulation and experiments of ortho para distillation at TLK.

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