NUCLEAR SPIN CONVERSION OF CD_4 IN SOLID PARAHYDROGEN

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Because of weak nuclear magnetic interactions, conversion between different nuclear spin states is a very slow process in the gas phase. On the contrary, the conversion in condensed phases is known to be quite fast. However, mechanism of the fast conversion in condensed phases has not been well understood yet. Last year at this meeting, we reported the nuclear spin conversion of CH_4 imbedded in solid parahydrogen.[a] We showed that the nuclear spin conversion in the solid is greatly accelerated by lattice vibrations of the crystal. Here, we report the nuclear spin conversion of CD_4 imbedded in parahydrogen solid. The rate of the nuclear spin conversion was obtained by the temporal change of rotation-vibration transition intensities of CD_4. Despite the small nuclear spin-nuclear spin coupling constant of CD_4 compared with that of CH_4, the conversion rate of CD_4 is found to be more than two times larger than that of CH_4 at the same temperature. In addition, the conversion of CD_4 shows stronger temperature dependence than that of CH_4. The difference of the nuclear spin conversion processes between CD_4 and CH_4 will be discussed.

[a] M. Fushitani and T. Momose, 56th International Symposium on Molecular Spectroscopy.