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High-pressure Brillouin study on plastic crystals of neopentane and adamantane SHIGEO SASAKI, YASUHIRO HORIBE, TETSUJI KUME, Department of Materials Science and Technology, Gifu University — Spherical top molecules neopentane and adamantane with Td symmetry crystallize face centered cubic (fcc) plastic crystals in which molecules are rather freely rotating at fcc lattice points. In the case of fcc plastic crystalline methane, the value of elastic anisotropy A is above 5 which is large than $A \sim 2.5$ of rare gas solids without molecular rotation, and shows strong pressure dependence because of the enhancement of the molecular rotation-translation (R-T) coupling by compression. Therefore, the purpose of the present study is to carry out the high-pressure Brillouin measurements for the fcc plastic crystals of neopentane and adamantane up to 0.75 and 0.5 GPa, respectively, and to clarify the dependence of the R-T coupling on pressure and molecular weight. The obtained value of A of fcc neopentane is 6.1 at 0.18 GPa and steeply increase up to 12.8 at 0.72 GPa. This remarkably large A values and its strong pressure dependence indicate that the R-T coupling effect in the plastic phase of neopentane is obviously large in comparison with methane. On the other hand, the plastic crystal of adamantane shows almost constant ($A = 2.5$) which is nearly the same as the rare gas solids, suggesting no R-T coupling effect.

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