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**Selective Control of Molecular Orientation by Terahertz Pulses**

LONG XU, ILIA TUTUNNIKOV, EREZ GERSHNABEL, YEHIAM PRIOR, ILYA AVERBUKH, Weizmann Institute of Science, Rehovot, Israel — Separation of the chiral enantiomers is of crucial importance in many biological, pharmaceutical, chemical and physical processes, and a variety of methods have been developed for this purpose over the years. Here we theoretically demonstrate enantio-selective control of molecular orientation with the help of strong THz pulses. We show that for properly polarization-shaped pulses, the induced orientation is enduring, and survives long after the field is over. This orientation is in all three laboratory axes, and the two enantiomers are oriented in opposite directions along and against the light propagation direction and perpendicular to the THz field polarization. We discuss the underlying mechanism of this phenomenon, explore effects of temperature and field parameters, and propose the observation of this effect by Second Harmonic Generation induced by interaction of the oriented molecules with probe optical pulse.

Long Xu  
Weizmann Institute of Science, Rehovot, Israel

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