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Laser control of molecular rotation: Expanding the utility of an optical centrifuge IAN MACPHAIL-BARTLEY, ALEXANDER MILNER, The University of British Columbia, WALTER WASSERMAN, The University of Queensland, Australia, VALERY MILNER, The University of British Columbia —
An optical centrifuge is a type of laser pulse capable of controlling unidirectional molecular rotation up to rotational frequencies of several THz. The efficiency of an optical centrifuge to spin a molecule depends on whether the molecule can follow the accelerated rotation of the centrifuge adiabatically. We discuss the development and characterization techniques for a new optical centrifuge built in our laboratory with a lower rotational acceleration that offers substantial improvements on the adiabaticity of spinning molecules. The improvements are quantified by an increase of dimensionless 'spinnability' by a factor of $\sim$20, which allows for the spinning of molecules with a higher moment of inertia and/or weaker anisotropic polarizability. Intended applications include the orientation of ensembles of chiral molecules and the study of rotational dynamics in superfluid helium nanodroplets.

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