MAR06-2005-001240

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

Sum-Frequency Spectroscopy as a Novel Probe for Molecular Chirality[1]

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Conventional techniques to probe molecular chirality, such as circular dichroism (CD), suffer from poor sensitivity because they are electric-dipole forbidden. Sum-frequency generation (SFG) is electric-dipole allowed even in chiral liquids, and therefore could be a more sensitive spectroscopic technique for probing molecular chirality in both electronic and vibrational transitions. We describe here a series of experiments that explore such a possibility. Despite the finding that chiral SFG is intrinsically weak for various reasons, we have succeeded in observing chiral SFG at both electronic and vibrational transitions with monolayer sensitivity. This work was supported by the U.S. Department of Energy.

[1]In collaboration with Na Ji and Mikhail Belkin, University of California at Berkeley.