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Giant Faraday rotation in two-dimensional semiconductors

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Abstract

Faraday rotation spectroscopy is an important experimental method for assessing the magneto-optical response of spintronic materials and devices. We introduce a high-performance broadband Faraday rotation spectroscopy technique suitable for measurements on the micron scale at cryogenic temperatures. The experimental method employs charge-coupled-device detection, thus bypassing the speed-limiting elements in modulation spectroscopy. Using the setup, we perform Faraday rotation spectroscopy of excitons in hBN-encapsulated monolayers of WSe_2 and $MoSe_2$ under moderate magnetic fields, resulting in in the highest known Verdet constants for any material in the visible regime.