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Unusual Electrooptic Response of Colloidal 2D Layered Transition Metal Dichalcogenide Nanodiscs DANIEL ROSSI, Texas A&M University, DONG HEE SON, Texas A&M Univ, JINWOO CHEON, JAE HYO HANN, WONIL JUNG, Yonsei University — We have characterized an unusual electrooptic response in colloidal solutions of TiS_2, WSe_2, and ZrS_2 layered transition metal dichalcogenide (TMDC) nanodiscs, where transient orientation order is induced by the time varying component of a square-wave electric field, giving rise to linear dichroism which decays even in the presence of the aligning field. Interestingly, identical electrooptic response were seen from both the rising and falling edges of the field, indicating that particle alignment responds to the absolute value of ΔE, regardless of the DC field offset, essentially performing the optical electric field edge detection. Both the magnitude and decay time of the electrooptic response were sensitive to solvent polarity, which we believe is related to the polarity dependent interparticle interactions previously observed in colloidal TiS_2 nanodisc solutions. This unusual behavior appears to be a general property of colloidal TMDC nanodiscs, potentially resulting from the time varying anisotropy of the induced dipole moment, in contrast to other anisotropic nanostructures with little to no dipole moment anisotropy, where the electrooptic response is dictated by the magnitude of the electric field.

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