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Ultrafast reflectivity dynamics in the honeycomb iridates JAMES HINTON, UC San Diego, UC Berkeley, LBNL, SHREYAS PATANKAR, ERIC THEWALT, UC Berkeley, LBNL, JAKE KORALEK, SLAC, LBNL, ALEJANDRO RUIZ, GILBERT LOPEZ, NICHOLAS BREZNAY, JAMES ANALYTIS, JOSEPH ORENSTEIN, UC Berkeley, LBNL — The combination of strong spin orbit coupling and Mott physics in the iridium oxides produces a variety of interesting phenomena. In the A_2IrO_3 compounds, this is thought to give rise to spin-anisotropic magnetic interactions described by the Kitaev model. While Na_2IrO_3 displays simple zigzag antiferromagnetism, the complex, incommensurate spiral magnetic order observed in γ-Li_2IrO_3 suggests that Kitaev exchange is the dominant spin interaction in this system. In this work, we performed ultrafast pump-probe reflectivity measurements on single crystals of Na_2IrO_3 and γ-Li_2IrO_3 using nJ pulses at 1.5 eV photon energy. At high temperatures, we observe a reflectivity transient corresponding to electronic heating and excitation across the Mott gap which is isotropic with respect to probe polarization. In γ-Li_2IrO_3 , a small anisotropy emerges upon cooling close to the Neél transition at 38 K, followed by an abrupt onset of a long lived, highly anisotropic photo-induced increase in the reflectivity at T_N. The temperature dependent dynamics of this signal indicate that it corresponds to non-thermal destruction of the magnetic order. Although similar reflectivity dynamics are observed at low temperature in Na_2IrO_3, there are no clear features related to the Neél transition at 16 K.

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