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Carrier Lifetimes and Dynamics in Epitaxial Grown Fe2O3 / Cr2O3 Thin Films Measured by Femtosecond Transient Reflectivity and Absorption ALAN JOLY, WAYNE HESS, GANG XIONG, DAVID LAMAN, JOSHUA WILLIAMS, SCOTT CHAMBERS, Pacific Northwest National Laboratory, Richland, WA 99352 — Carrier lifetimes in semiconductors govern many of the physical properties of these materials including conductivity and photocatalytic yield. The use of layered thin films of semiconductor materials may allow the separation of charge carriers and hence increased carrier lifetimes, due to the heterojunction created at the interface between the two materials. In this study, the excited state carrier lifetimes of thin films of layered Fe_2O_3 and Cr_2O_3 grown on Sapphire substrates is measured using femtosecond transient reflectivity and absorption spectroscopy. Results from these experiments utilizing probe wavelengths between 1.5 and 2.7 eV on a variety of Fe_2O_3/Cr_2O_3 thin films show dynamics from the 100 fsec to hundreds of psec timescales. These dynamics can be interpreted in terms of excited state carrier relaxation, recombination, and trapping, possibly leading to the formation of defect states.

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