Epitaxial Growth of Heusler Co$_2$MnSi Heterostructures: Electronic and Structural Properties\textsuperscript{1} THOMAS NEULINGER, Department of Physics; University of California, Santa Barbara, SAHIL PATEL, Department of Materials Science; University of California, Santa Barbara, ALEXANDER KOZHANOV, California NanoSystems Institute; University of California, Santa Barbara, BRIAN SCHULTZ, Department of Electrical and Computer Engineering; University of California, Santa Barbara, CHRIS PALMSTROM, Department of Electrical and Computer Engineering and Materials Science; University of California, Santa Barbara — The Heusler alloy Co$_2$MnSi is predicted to be a half-metal, a material that is spin-polarized at the Fermi energy. We have demonstrated growth by molecular beam epitaxy of Co$_2$MnSi, Cr/Co$_2$MnSi, and a complete Co$_2$MnSi/MgO/Co$_2$MnSi(001) magnetic tunnel junction on epitaxial GaAs(001) surfaces without air exposure. Epitaxial Cr layers have been used to exchange bias Co$_2$MnSi. In-situ electron diffraction and scanning tunneling microscopy, and ex-situ X-ray diffraction techniques are used to characterize the crystal quality. The magnetic properties are investigated using vibrating sample and superconducting quantum interference device magnetometry. We present these results and will compare them with temperature dependent magnetotransport and tunneling spectroscopy measurements, with emphasis on the influence of Co$_2$MnSi surface termination.

\textsuperscript{1}This work was supported by SRC, award 2011-IN-2153, and the NSF MRSEC program under DMR-0819885

Thomas Neulinger
Department of Physics; University of California, Santa Barbara

Date submitted: 08 Nov 2012

Electronic form version 1.4