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Raman Scattering Studies of Magnons and Magnetodielectric Effects in $CoCr_2O_4$[1] ASTHA SETHI, TAYLOR BYRUM, Dept. of Physics and Materials Research Lab., UIUC, REBECCA MCAULIFFE, Materials Science and Engineering and Materials Research Lab, UIUC, SAMUEL GLEASON, JOHN E. SLIMAK, Dept. of Physics and Materials Research Lab., UIUC, DANIEL P SHOEMAKER, Materials Science and Engineering and Materials Research Lab, UIUC, S LANCE COOPER, Dept. of Physics and Materials Research Lab., UIUC — The multiferroic spinel $CoCr_2O_4$ exhibits magnetodielectric behavior whose origin is a subject of controversy. We present a Raman spectroscopic study of the magnon spectrum of $CoCr_2O_4$ as functions of temperature, pressure, and magnetic field, with the aim of elucidating the microscopic origin of magnetodielectric behavior. Below T_C = 94 K, we observe a 16 cm^{-1} magnon mode with an anomalously large Raman intensity that reflects large magneto-optical coupling in $CoCr_2O_4$. The strong magnetic-field-induced suppression of the magnon Raman intensity in $CoCr_2O_4$ suggests that the magnetodielectric behavior in $CoCr_2O_4$ arises from the field-dependent suppression of magnetic fluctuations that are strongly coupled to long-wavelength phonons. Applied pressure suppresses the Raman susceptibility and field-dependence of the magnon, demonstrating that strain can be used to sensitively tune the magnetodielectric and magneto-optical properties of $CoCr_2O_4$.

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