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Negative Refraction Index in Magnetic Semiconductors ADIL-GERAI KUSSOW, University of Massachusetts Lowell, Department of Physics, ALKIM AKYURTLU, University of Massachusetts Lowell, Electrical and Computer Engineering Department — A novel principally homogeneous, non-composite magnetic semiconductor, or Chromium doped Indium Oxide, with the Curie temperature well above room temperature with natural negative refraction index in the THz range will be presented. The negative refraction index arises due to the overlapping of the negative permittivity in the plasmon subsystem and the negative permeability in the spin wave (magnon) subsystem within the same frequency domain. Since the losses in the magnetic mode are almost negligible, and the additional scattering losses due to the inhomogeneities are not present in our homogeneous medium, the total losses are exclusively due to the plasmon decay. Consequently, the negative refraction index wave has losses approximately 5 times smaller than losses in any of the currently known inhomogeneous designs. The parameters of both plasmon and magnon subsystems are calculated from the extended Band Theory, and first principles, respectively, and validated with available experimental data. Analytical expressions which describe the negative refraction index band are also presented.

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