Nonlinear and chiral response of topological semimetals and other chiral media

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Light-matter interaction in chiral media has many important implications from life science to quantum cryptography. Here, we will present a brief overview on chirooptical effects and related light matter interactions. We will discuss the chiral phases of liquid crystals and novel topological semimetals.

One example is the chiral topological semimetal PdGa with a crystal structure that has a well-defined handedness and strong spin orbit interactions. This is the first known compound where electronic bands acquire a maximal Chern number of C = ±4 [1]. In such a case exotic transport properties are expected, e.g. quantized photocurrents. However, also structural properties are remarkable. Using Raman spectroscopy, we uncover a strong and sharp electronic resonance around E = 2.35 eV that allow us to follow changes of electronic Raman scattering occurring in moderate magnetic fields as well as phonon anomalies. Both observations point to a possible modification of the electronic band structure in PdGa in magnetic fields.

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