Infrared Sn_xGe_{1-x} alloys for safe, sustainable, and frequency-tunable quantum materials

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Project Summary: The goal of this program is to establish group-4 alloys (including Sn, Si, and Ge) as quantum materials with band gaps tunable from the infrared wavelengths into to the zero-gap regime. We will combine first-principles calculations with multiband effective mass modeling to predict and understand the optoelectronic properties of these narrow-gap semiconductors. Our theoretical investigations will be performed in concert with Professor Chris Palmstrøm, who will synthesize and characterize thin films of these materials using molecular beam epitaxy. We anticipate our research will lead to not only more efficient infrared semiconductor materials but also novel topological materials.
