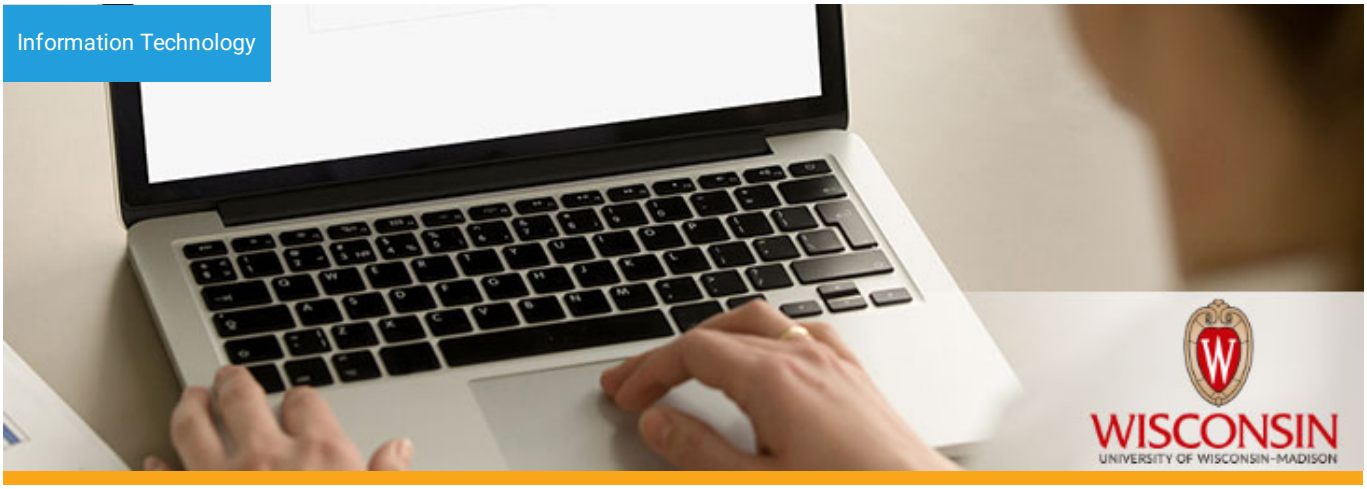
Information Technology



SILICON-GERMANIUM ALLOY-BASED QUANTUM DOTS WITH INCREASED ALLOY DISORDER AND ENHANCED VALLEY SPLITTING

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Overview

Silicon-Germanium (SiGe) heterostructures are used for many purposes in the modern electronics industry, forming the basis of devices such as SiGe heterojunction bipolar transistors and Si/SiGe modulation-doped field effect transistors. Most recently, SiGe alloys have become a material of choice for quantum computing applications. In particular, silicon quantum dots formed in the silicon well of a Si/SiGe heterostructure have been used to trap electrons in qubits for quantum computing, wherein the spins of the trapped electrons store and process quantum information

The Invention

Researchers from UW-Madison and the University of New South Wales have devised an important enhancement to quantum well design using SiGe alloy heterostructures. Using some amount of germanium in the quantum well increases the fraction of germanium in the barrier, resulting in significant concentration fluctuations in the quantum well where the electron wavefunction is large, and valley splitting is increased substantially. Adding germanium in the well results in a positive effect on valley splitting not previously known, and using SiGe alloy in the well reduces the carrier mobility.

Additional Information

For More Information About the Inventors

- Mark Friesen
- Susan Coppersmith

Publications

- Paquelet Wuetz, B., Losert, M.P., Koelling, S. et al. Atomic fluctuations lifting the energy degeneracy in Si/SiGe quantum dots. Nat Commun 13, 7730 (2022). https://doi.org/10.1038/s41467-022-35458-0

Tech Fields

- Information Technology : Hardware
- Semiconductors & Integrated Circuits : Quantum dot technologies

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842