Reduced Alloy Scattering Leads to Record High-Mobility for Holes in GeSn

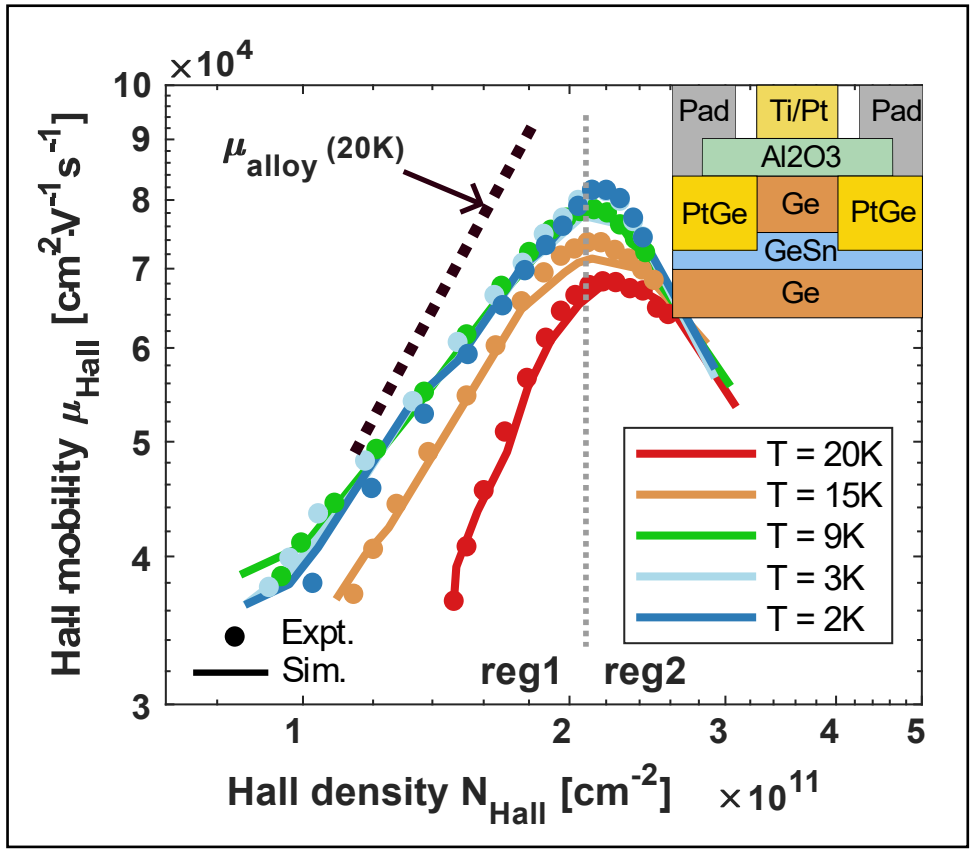

Figure: Magneto-transport data for $Ge_{0.92}Sn_{0.08}$/Ge heterostructure field-effect transistor (inset) showing mobility versus density experimental data (points) in agreement with simulations results (lines) for a variety of temperatures. Alloy scattering only simulation (black dotted line) reveals low-density regime is limited by alloy scattering.

Scientific Achievement

A CINT User Team achieved 4x improvement in mobility for GeSn/Ge quantum wells on a commercial 200 mm wafer platform, demonstrating reduced alloy scattering compared to similar systems.

Significance and Impact

This work highlights GeSn's potential for silicon foundry-compatible platform for high-speed electronics , optoelectronics, spintronics, and hole-spin qubits.

Research Details

- Record mobility of 80,000 $cm^2V^{-1}s^{-1}$
- Effective mass of $0.0689m_0$
- Effective g-factor of 13.6
- Alloy scattering disorder potential of 0.8 eV

Hutchins-Delgado, T. A.; Gangwal, S.; Akwabli, S.; Bradicich, A.; Petluru, P.; Stanchu, H.; Acharya, S.; Scott, R.; Rosson, N.; Povolotskyi, M.; Tai, C.; Liu, C.; Li, J.; Lilly, M. P.; Kuo, W. C.; House, S. D.; Vasileska, D.; Yu, S.; Lu, T. Experimental Characterization and Modeling of High Hole Mobility GeSn Quantum Wells: The Role of Alloy Disorder Scattering. *Small Science.* 2026.

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