Glass Packaging for Quantum Devices

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By leveraging the exotic properties of quantum mechanics, such as quantum entanglement, quantum interference, and/or quantum state squeezing, a quantum sensor can perform extremely precise measurements with unique and unmatchable performance. In a quantum sensor, quantum packaging is one of the most essential and critical components to render sensing functions. Glass is a material that has been studied for centuries and recently it is being developed as a potential solution for advanced packaging.

At the Penn State Nanofabrication Laboratory, we are investigating the use of glass packaging for novel quantum devices. This poster presents our recent progress in the development of glass packaging. Specifically, we demonstrated a scalable process for fabricating unique atomic and molecular clocks and quantum antennas. Our glass packaging enables small size (from µm to cm) features hermetically sealed with high vacuum level, multilayered wafer bonding, and is not limited to glass and silicon. We offer access to a state of art fabrication tool set, including thermo-compression bonding, anodic bonding, deep Si etching, and femtosecond laser micromachining (laser ablation, multiphoton polymerization, laser writing, and laser welding).