Room Temperature Single-Photon Emitters in Silicon Nitride

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Categories:
- Chemistry and Chemical Analysis
- Materials and Manufacturing

Keywords:
- Advanced Sensing
- Chemistry and Chemical Analysis
- Chips
- Materials and Manufacturing
- Quantum
- Quantum Communication
- Quantum Materials
- Silicon
- Stability
- Thin Films

Researchers at Purdue University have developed new single-photon emitters in silicon nitride (SiN) films that can operate at room temperature. Single-photon emitters are used in quantum information technology, quantum sensing, quantum communication, and quantum integrated circuit applications. Traditional heterogeneous and hybrid techniques for creating quantum devices require complex geometries and a combination of different materials for use of single-photon emitters with on-chip platforms. Purdue researchers have fabricated new SiN films on silicon dioxide substrates containing single-photon emitters to enable scalability for quantum on-chip devices. In testing using photophysical analysis, the brightness of greater than 105 counts per second, as well as stability and high purity of quantum emitters in SiN films, were observed. Specifically, a second-order autocorrelation function at zero time delay below 0.2 at room temperatures was achieved. Single-photon emitters in SiN material show promise to reduce integration losses and to allow for direct, scalable integration of quantum light sources with the well-established photonic platforms.

Advantages:
-Adaptable with On-Chip Platforms
-Room Temperature Stability

Potential Applications:
-Quantum Information Technology

-Quantum Sensing
-Quantum Communication
-Quantum Integrated Circuit

Technology Validation:
In testing using photophysical analysis, the brightness of greater than 105 counts per second, as well as stability and high purity of quantum emitters in SiN films, were observed. Specifically, a second-order autocorrelation function at zero time delay below 0.2 at room temperatures was achieved.

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