# Isolated color centers in Si as single photon sources for quantum photonics: recent advances and open challenges

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Silicon-on-insulator (SOI) is the main material platform for large-scale quantum photonics, with the integration of hundreds of components in cm²-scale programmable chips. However, further up-scaling is hindered by the lack of "on-demand" sources of indistinguishable single photons in silicon. In this context, the observation of photon antibunching for about a dozen of different point defects acting as color centers in Si could be a game changing advance [1].

In this talk, we will first present some basic properties of color centers emitting at telecom-wavelength, with emphasis on the O-band G center and its recently discovered brighter cousin, G*[2]. We will also introduce W, a bright color center emitting at around 1.22 µm, for its strong interest for integrated quantum photonics [3].

We will next review the first CQED experiments that have been performed with color centers in SOI microstructures, and will highlight the recent observation of the Purcell effect both in ensemble measurements (see Fig.1 and [4,5]) and at the single defect level [6].

In the light of this recent progress, we will briefly discuss the application perspectives of Si color centers to quantum communications and to quantum computing/simulation on integrated photonic chips, and the numerous challenges to be faced along this road.

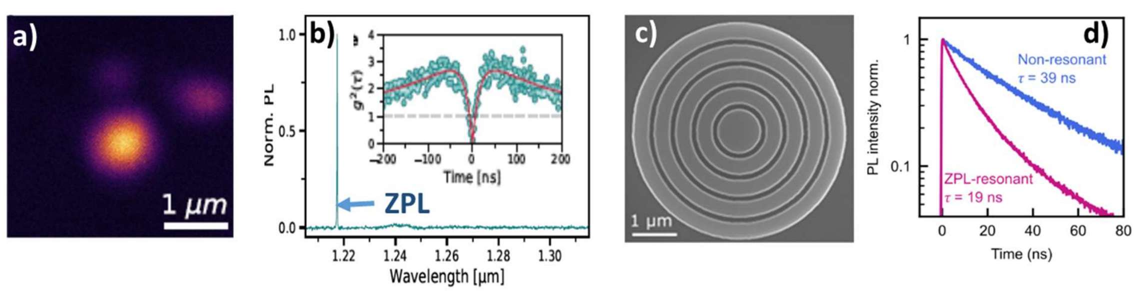


**Figure 1:** a) Photoluminescence (PL) map showing an isolated W center in SOI. b) PL spectrum and photon-correlation histogram for this defect at 10K. **c)** SEM view of a SOI Bullseye cavity. **d)** PL decay curves obtained when the zero-phonon line (ZPL) is either non-resonant (blue) or ZPL-resonant (pink) with the cavity mode.

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