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Adhesive Bonding of GaAs with Embedded Charge-tunable Indium Arsenide Quantum Dots to a Silicon Substrate

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The integration of multiple materials in a nanophotonic chip is an effective way of fulfilling the many demands put on photonic quantum information technology. In this work, we present the heterogeneous integration of a p-i-n-i-n-doped Gallium Arsenide die with embedded Indium Arsenide quantum dots onto a Silica surface of a Silicon wafer. We present measurements of tunable single-photon emissions from the photonic circuits fabricated from this die and the results of new fabrication parameters for the grating couplers to and from the chip. Dots are shown to be in line with emissions from similar chips with a tunable range on par with other diode structures. We finally present a new concept for a nanophotonic circuit using the TM mode to excite the emitter and simulations of the expected efficiency of such a coupling. While more measurements are to come, so far indications are that high-quality integrated photon sources could be within reach with our method.

Field of study

Quantum Physics

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