Nanoplasmonics as enabler of room-temperature quantum nanophotonics

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Photonic quantum dynamics of strong coupling of single molecules [1] and single quantum dots [2] to ultra-confined light fields in plasmonic resonators has recently been demonstrated at ambient temperatures. The fact that strong-coupling conditions may be reached at room temperature is of immense interest because it represents a clear route to a practical implementation and use of quantum behaviour in nanophotonic systems and its application in biosensing [3]. Here we discuss the principles of room-temperature single-emitter strong coupling in nanoplasmonics and illuminate perspectives for quantum nanophotonics [4]. We will highlight the physics associated with recently demonstrated room-temperature strong coupling of single molecules in a plasmonic nano-cavity [1] and near-field generated strong coupling of single quantum dots [2] and single quantum emitter Dicke enhancement [5] paving the road towards single-photon quantum nonlinearities. The presentation will also explain near-field enhanced single-photon emission in near-zero index materials [6] multipartite dynamic quantum entanglement [7].

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