Abstract

A semiconductor quantum dot is a potentially excellent source of indistinguishable photons and host for a spin qubit. But why is the performance good but not ideal? What can we do to improve things? In the best case it turns out that fluctuations in the nuclear spins of the host material limit not just the electron spin coherence but also the quality of the single photons emitted by a single quantum dot. The quantum dot nuclear spins are largely decoupled from those of the host material enabling them to be probed in detail. Various strategies to overcome this source of noise will be discussed both for single photon generation and operation of a spin qubit.