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Spin relaxation in graphene quantum dots GUIDO BURKARD, PHILIPP STRUCK, University of Konstanz, Germany — With its low concentration of nuclear spins and relatively weak spin-orbit coupling, graphene is a promising host material for electron spin qubits. We have calculated the spin relaxation time T_1 of a single spin in graphene quantum dots [1,2] as a function of the externally applied magnetic field B. We find that in quantum dots without coupling between the valleys K and K' in the graphene band structure, there is an effective time-reversal symmetry breaking which prevents the Van Fleck cancellation at $B = 0$ known from semiconductor quantum dots. In combination with the lower dimensionality of the phonons in graphene, this leads to a distinct value of the exponent α in the power law $T_1 \propto B^\alpha$ which can be different from the value for semiconductor quantum dots.

[1] B. Trauzettel, D.V. Bulaev, D. Loss, and G. Burkard, Nature Phys. **3**, 192 (2007).
[2] P. Recher, J. Nilsson, G. Burkard, and B. Trauzettel, Phys. Rev. B **79**, 085407 (2009).

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