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**Long Electron Spin Lifetimes in Armchair Graphene Nanoribbons** MATTHIAS DROTH, GUIDO BURKARD, University of Konstanz, 78457 Konstanz, Germany — Armchair graphene nanoribbons (aGNR) are promising as a host material for electron spin qubits because of their potential for scalability and long coherence times [1]. The spin lifetime $T_1$ is limited by spin relaxation, where the Zeeman energy is absorbed by lattice vibrations [2], mediated by spin-orbit and electron-phonon coupling. We have calculated $T_1$ by treating all couplings analytically and find that $T_1$ can be in the range of seconds for several reasons: (i) Van Vleck cancellation; (ii) weak spin-orbit coupling; (iii) low phonon density; (iv) vanishing coupling to out-of-plane modes due to the electronic structure of the aGNR. Owing to the vanishing nuclear spin of $^{12}$C , $T_1$ is a good measure for overall coherence. These results and recent advances in the controlled production of graphene nanoribbons [3] make this system interesting for classical and quantum spintronics applications.

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[2] M. Droth and G. Burkard, Phys. Rev. B 84, 155404 (2011).
[3] X. Zhang et al., arXiv:1205.3516 (2012).

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