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Isolation and Control of Spins in Silicon Carbide with Millisecond-Coherence Times[1] DAVID J. CHRISTLE, ABRAM L. FALK, PAOLO ANDRICH, PAUL V. KLIMOV, DAVID D. AWSCHALOM, Institute for Molecular Engineering, University of Chicago, JAWAD UL HASSAN, NGUYEN T. SON, ERIK JANZÉN, Department of Physics, Chemistry and Biology, Linköping University, TAKESHI OHSHIMA, Japan Atomic Energy Agency — The elimination of defects from silicon carbide (SiC) has facilitated its move to the forefront of the optoelectronics and power-electronics industries. Nonetheless, because the electronic states of SiC defects can have sharp optical and spin transitions, they are increasingly recognized as a valuable resource for quantum-information and nanoscale-sensing applications. We demonstrate that individual electronic spin states of the divacancy defect in highly purified monocrystalline 4H-SiC can be isolated and coherently controlled[2]. This defect has analogous behavior to the prominent nitrogen-vacancy center in diamond, yet exists in a material amenable to modern growth and microfabrication techniques. We spectroscopically identify the different forms of divacancies, and show that divacancy spins exhibit an exceptionally long ensemble Hahn-echo coherence time that exceeds one millisecond.

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[2]D. J. Christle, A. L. Falk, P. Andrich, P. V. Klimov, J. Hassan, N. T. Son, E. Janzén, T. Ohshima, and D. D. Awschalom, Nat. Mater. (to be published)

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