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Optically Addressable Silicon Vacancy-Related Spin Centers in Rhombic Silicon Carbide with High Breakdown Characteristics and ENDOR Evidence of Their Structure

Soltamov V., Yavkin B., Tolmachev D., Babunts R., Badalyan A., Davydov V., Mokhov E., Proskuryakov I., Orlinskii S., Baranov P.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 American Physical Society. We discovered a family of uniaxially oriented silicon vacancy-related centers with S=3/2 in a rhombic 15R-SiC crystalline matrix. We demonstrate that these centers exhibit unique characteristics such as optical spin alignment up to the temperatures of 250 °C. Thus, the range of robust optically addressable vacancy-related spin centers is extended to the wide class of rhombic SiC polytypes. To use these centers for quantum applications it is essential to know their structure. Using high frequency electron nuclear double resonance, we show that the centers are formed by negatively charged silicon vacancies VSi- in the paramagnetic state with S=3/2 that is noncovalently bonded to the neutral carbon vacancy VC0 in the nonparamagnetic state, located on the adjacent site along the SiC symmetry c axis.

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