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Spin centres in SiC for all-optical nanoscale quantum sensing under ambient conditions

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Level anticrossing (LAC) spectroscopy was demonstrated on a family of uniaxially oriented spin colour centres with $S = \frac{3}{2}$ in the ground and excited states in a hexagonal 4H-, 6H- and rhombic 15R- SiC polytypes. It was shown that these centres exhibit unique characteristics such as optical spin alignment up to the temperatures of 250 °C. A sharp variation of the IR photoluminescence intensity in the vicinity of LAC with the record contrast was observed, which can be used for a purely all-optical sensing of the magnetic field and temperature without applying radiofrequency field. A distinctive feature of the LAC signal is weak dependence on the direction of the magnetic field that allows one to monitor the LAC signals in the non-oriented systems, such as powder of SiC nanocrystals.

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