Real time monitoring of nitrogen vacancy fluorescence during ultrafast pulsed laser heating of diamond

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Nitrogen-vacancy (NV) color centres are optical defects in diamond that have been widely studied due to their exceptional fluorescence, magnetic, and spin properties, which enable applications across a broad range of imaging and quantum technology areas. Some emerging technology areas require the use of single and isolated NV centres in single crystal diamond materials. Here, we report research towards the development of scalable methods using laser fabrication techniques to produce NV centres within the diamond lattice.

Laser writing using a femtosecond laser with aberration control enables precise positioning and creation of vacancies within the diamond lattice [1, 2]. As an alternative to conventional furnace annealing, the heat produced by the laser can be utilized as localized annealing which allows the vacancies to migrate until they bond to nitrogen impurities. Creation of NV centres with localized pulsed laser annealing can also be monitored in situ via the collection of fluorescence intensity signals, the orientation of the created centre can then be determined using polarization imaging.

Here we report the research of real time fluorescence monitoring during the creation of NV color centres in diamond using a femtosecond laser.

References

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