New single photon sources by engineering monolayer-thick semiconductors on the atomic scale

Initiative: Integration molekularer Komponenten in funktionale makroskopische Systeme (beendet, nur noch Fortsetzungsanträge)

Bewilligung: 25.06.2017

Laufzeit: 3 Jahre

Projekt-Website: https://www.fz-juelich.de/pgi/pgi-9/DE/Forschung/002-Exploring-Quantum-Systems/024-2D-Materials/242-Implantation/_node.html

Monolayer-thick transition metal dichalcogenides (TMDs) with the chemical formula MX2 (M = Mo,W; X = S,Se) constitute a new class of direct bandgap semiconductors. Their remarkable physical properties, which result from their two-dimensional (2D) geometry, lattice symmetry and massive atoms, make them an exciting platform for developing photonic devices with new functionalities. In order to realise this promise, methods for material modification analogous to those used for standard semiconductors have to be developed. The primary aims of this project are to develop ultra-low-energy ion implantation as a method for the controllable modification of TMDs on the atomic scale and to incorporate implanted TMDs into non-classical light emitting diodes (LEDs). Quantitative atomic-scale structural and electronic characterisation techniques that are supported by ab initio modelling of material properties will be developed to control these processes. The results of the project will have far-reaching implications for quantum engineering and quantitative characterisation of 2D materials.

Projektbeteiligte

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Open Access-Publikationen

Plasmons in MoS2 studied via experimental and theoreticalcorrelation of energy loss spectra
New Single Photon Sources by Optoelectronic Tailoring of 2D Materials Using Low Energy Ion Implantation
Controlled Functionalisation of 2-D Materials for Quantum Device Development: assessment of Single Atom Behaviour via Atomic Resolution Electron Microscopy and Spectroscopy

Es werden die Institutionen genannt, an denen das Vorhaben durchgeführt wurde, und nicht die aktuelle Adresse.