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Supplementary Information for

'Non-invasive transmission electron microscopy of vacancy defects in graphene produced by ion irradiation'

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Supplementary Figure S1: Isolating mono- and trilayer graphene. (b) Optical image of a large graphene flake on Si/SiO₂ substrate with a monolayer region (marked 1L) and a trilayer region (marked 3L) (b) Optical image of the same flake after transfer onto a TEM grid. The mono- and trilayer regions are shown with doted black lines. Scale bar corresponds to 50 μ m on both images.



Supplementary Figure S2. (a) Optical image of graphene flakes on SiO_2/Si substrate with a monolayer region marked 1L and a large trilayer region marked 3L. (b) MoS_2 flakes deposited on top of graphene; blue and yellow colours indicate thin and thick layers of MoS_2 flakes, respectively. (c) optical image of MoS_2 -graphene flakes after transfer onto the TEM grid. Scale bars correspond to $50\mu m$.



Supplementary Figure S3. Identification of the number of layers in studied graphene samples. The number of layers in each sample was determined using Raman spectrometry. The above spectra were obtained on mono-, bi- and trilayers shown in Figs. S1 and S2.



Supplementary Figure S4. Simulated 80kV AC-HRTEM images of a variety of defects in triple layer graphene at different focusing conditions and taking into account spherical aberration. The structural models were relaxed using the DFTB formalism. Each row shows a focal series for the same defect, at a progressively increasing defocus. The images correspond to defects residing in the middle layer of a trilayer graphene sample. 'sv1' and 'sv2' refer to single vacancies where a carbon atom was removed from sublattice A and B, respectively. The scale bar corresponds to 1 nm.