

ADVANCED OPTICAL MATERIALS

Supporting Information

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**Impact of Individual Structural Defects in GaAs Solar Cells:
A Correlative and In Operando Investigation of Signatures,
Structures, and Effects**

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Supplementary Material

Impact of individual structural defects in GaAs solar cells: a correlative and *in operando* investigation of signatures, structures, and effects

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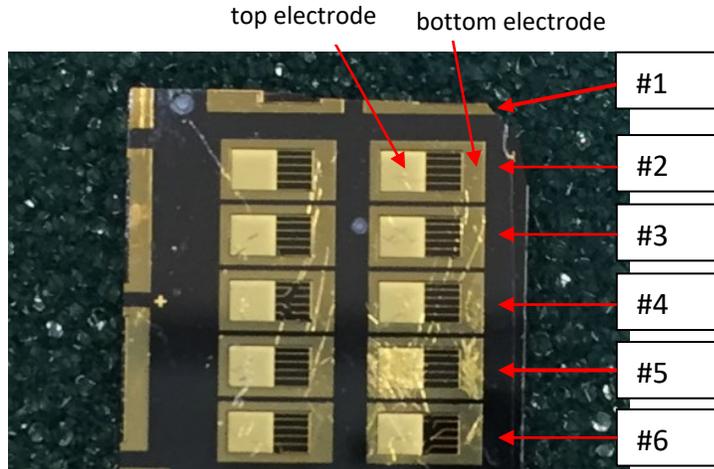


Fig. A1. Optical image of one portion of the GaAs solar cell device. Shown are multiple independent small cells (the right column has 6 such cells, although #1 is mostly missing). Each small cell has five stripes separated by electrode fingers.

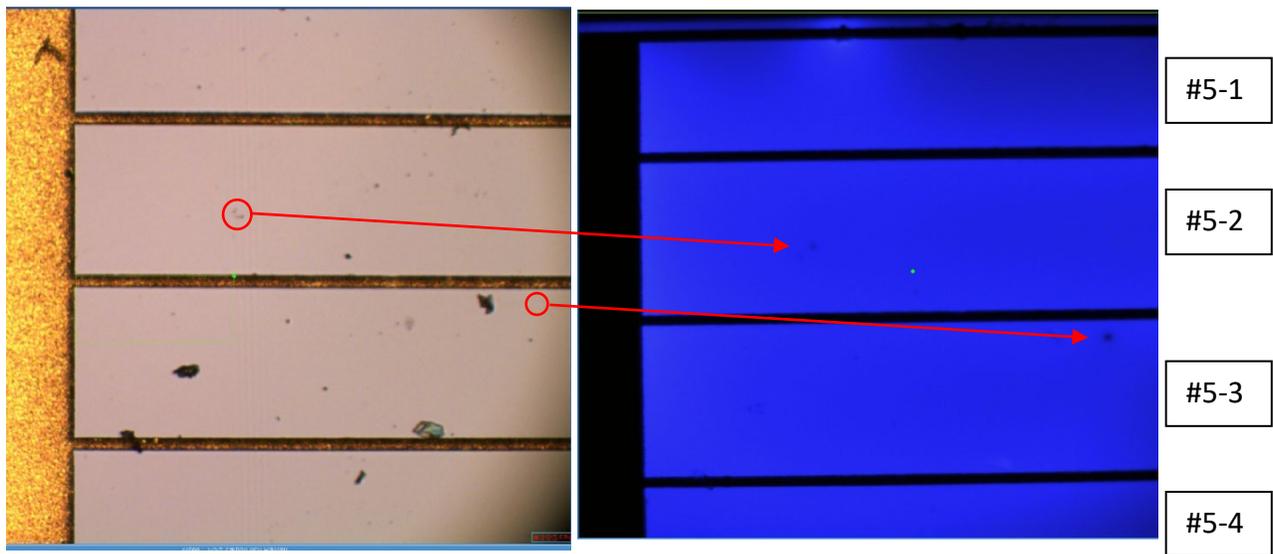


Fig. A2. Comparison of optical and EL image of cell #5. In the area #5-3, the dark spot in the EL image has no correspondence in the optical image. In the area #5-2, the dark spot in the EL image appears to match some surface features in this low-resolution optical image. However, under higher resolution, the surface features actually do not match the dark spots in EL. The exact locations of the three dislocation defects shown in Fig. 1 relative to the surface features are shown in Fig. A3.

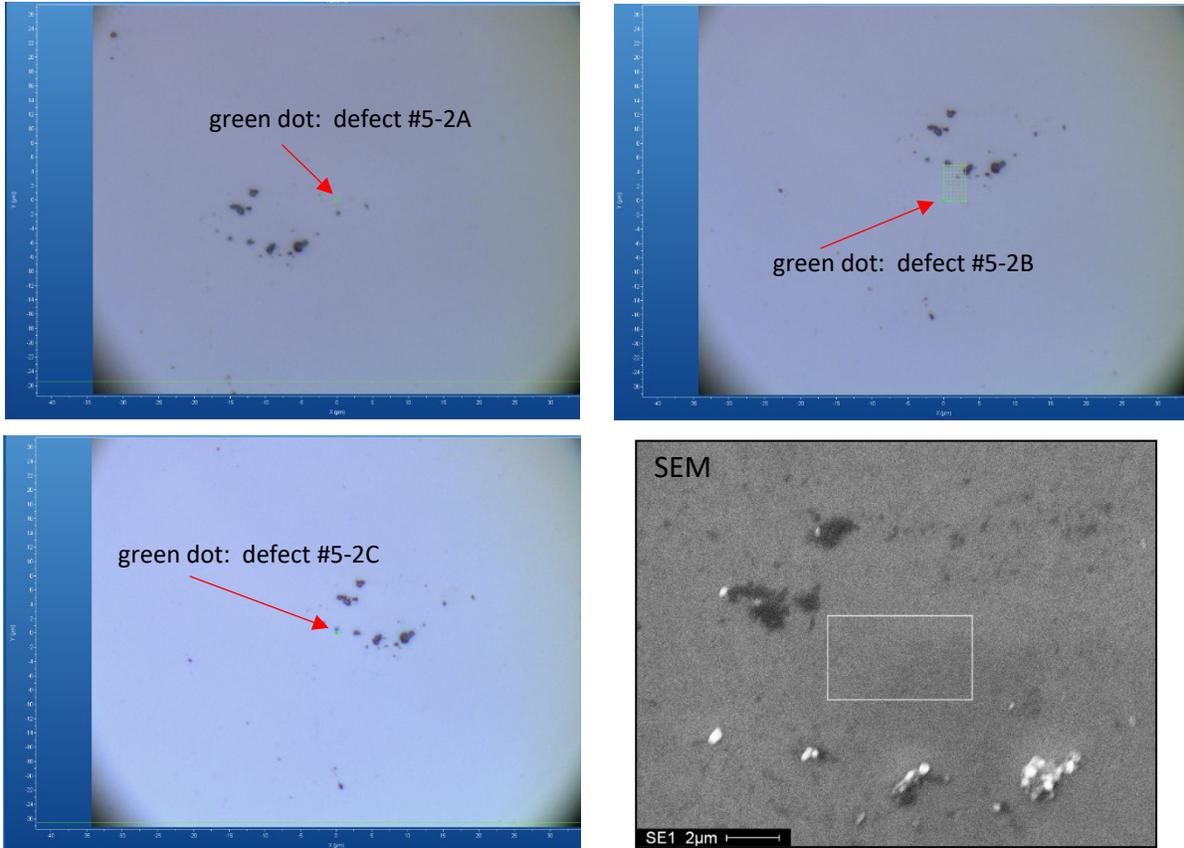
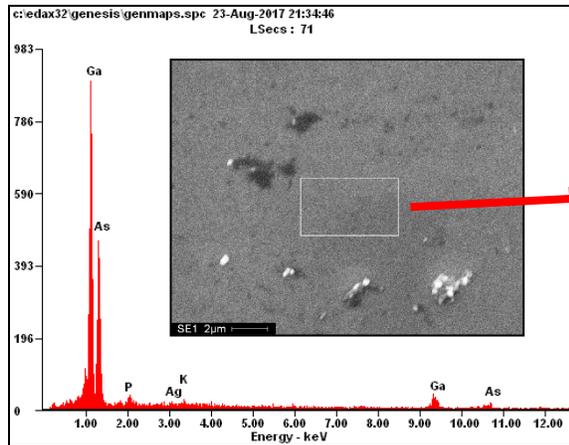
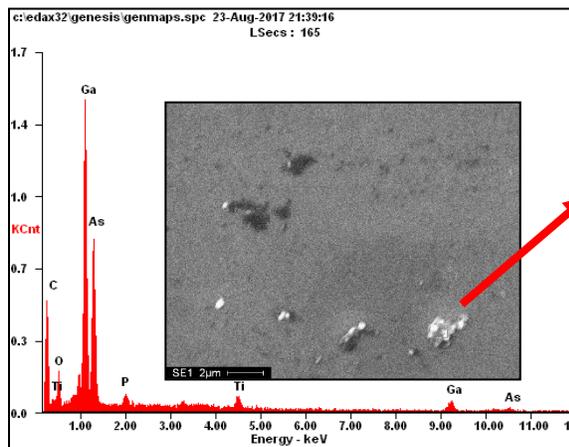


Fig. A3. Optical and SEM images showing the precise location of the three defects (indicated by the green dots) and parasitic features on the device surface.



<i>Element</i>	<i>Wt%</i>	<i>At%</i>
<i>PK</i>	01.43	03.27
<i>AgL</i>	01.50	00.99
<i>KK</i>	00.95	01.72
<i>GaK</i>	44.64	45.35
<i>AsK</i>	51.48	48.67
<i>Matrix</i>	Correction	ZAF



<i>Element</i>	<i>Wt%</i>	<i>At%</i>
<i>CK</i>	43.44	77.25
<i>OK</i>	04.89	06.53
<i>PK</i>	01.09	00.75
<i>TiK</i>	03.03	01.35
<i>GaK</i>	26.08	07.99
<i>AsK</i>	21.47	06.12
<i>Matrix</i>	Correction	ZAF

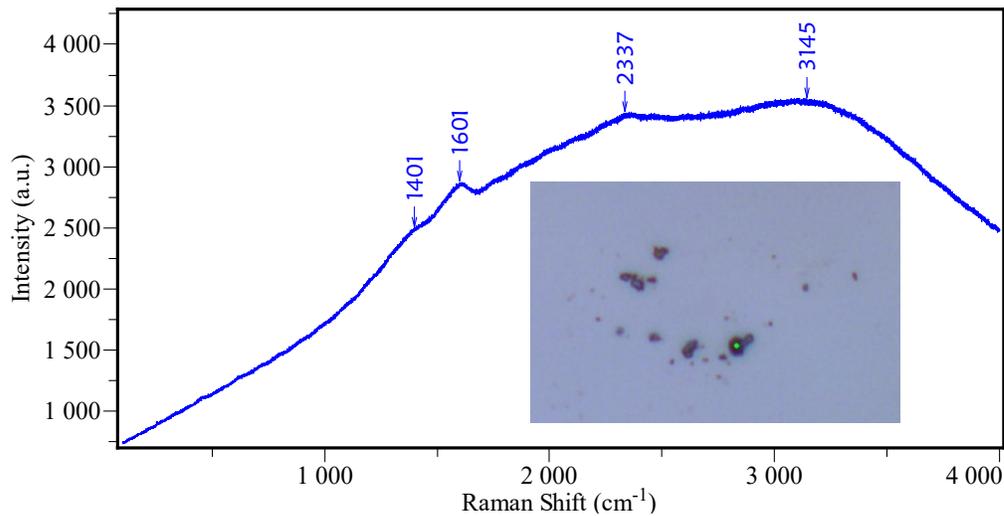


Fig. A4. EDX analysis of parasitic depositions on the surface of the GaAs solar cell (area #5-2). The extra depositions are found to be rich in carbon with some oxygen. Their Raman spectra are typical of amorphous carbon. The Raman spectrum shown was measured from the location of the green dot on the optical image.

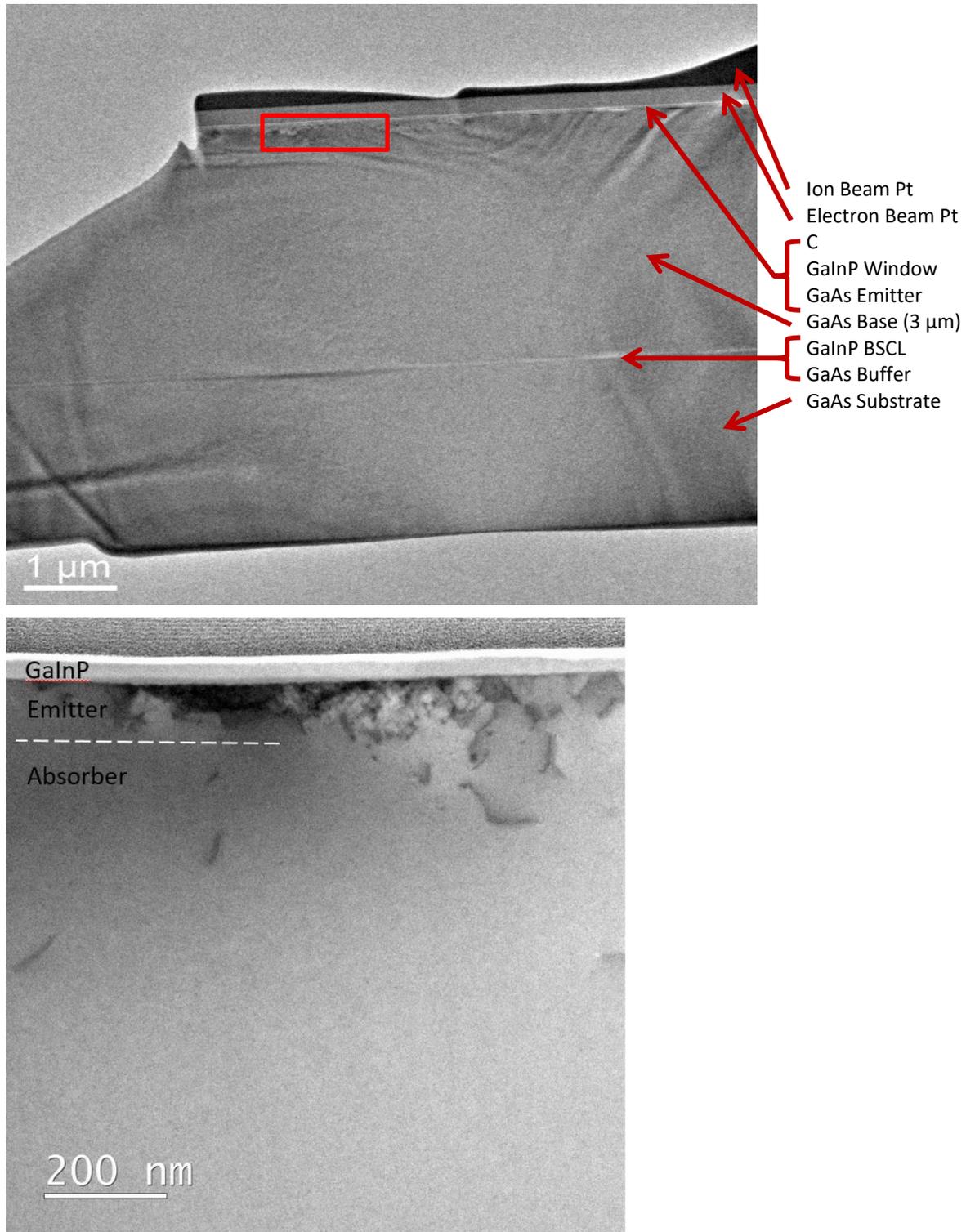


Fig. A5. Low-resolution TEM images of a cross-sectional view of the defect #5-2A. The red box indicates the approximate area that is viewed in the higher resolution image of Fig. 5(a).

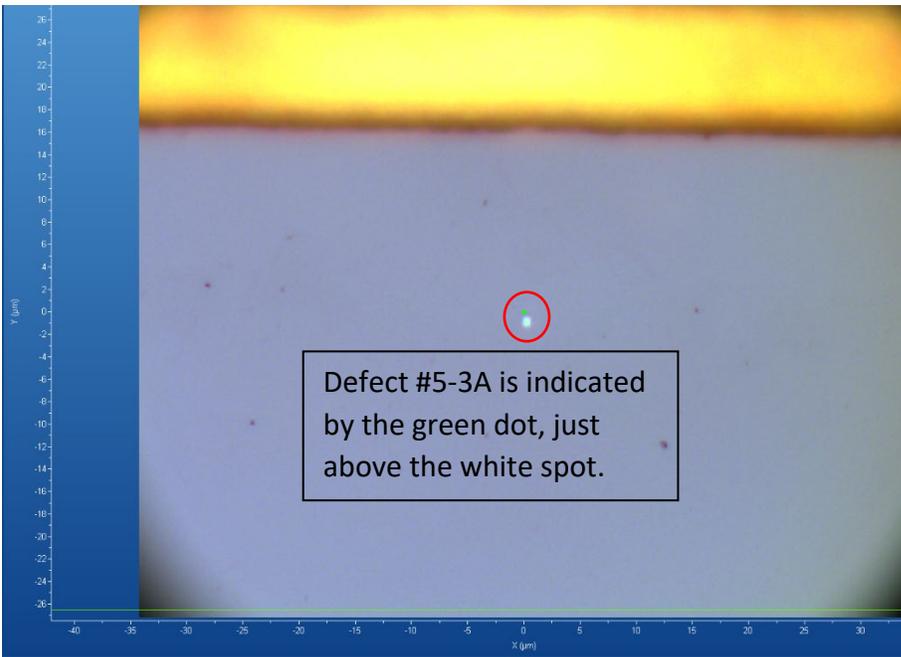
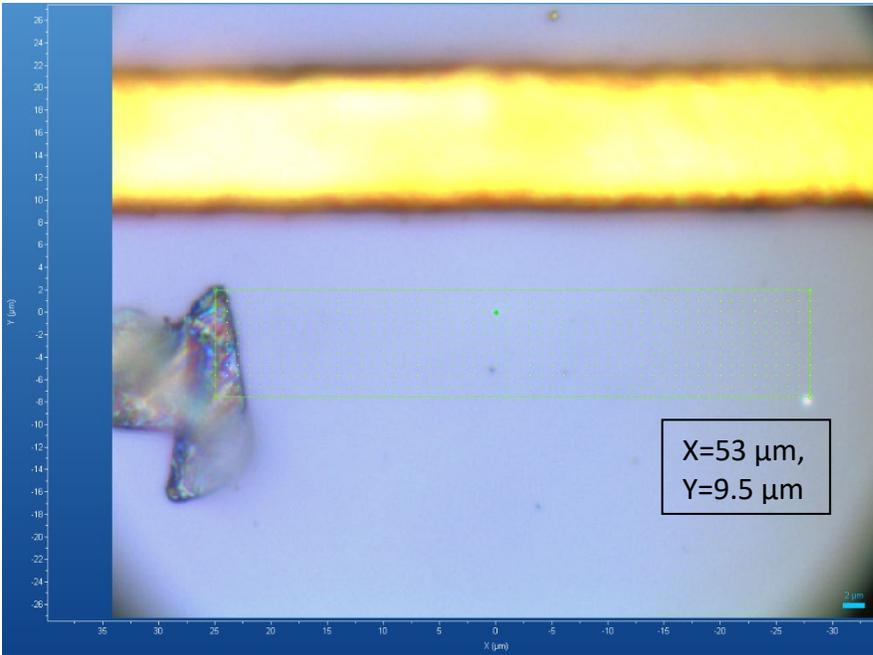


Fig. A6. Optical images indicating the precise location of the defect #5-3A (indicated by the green dots).

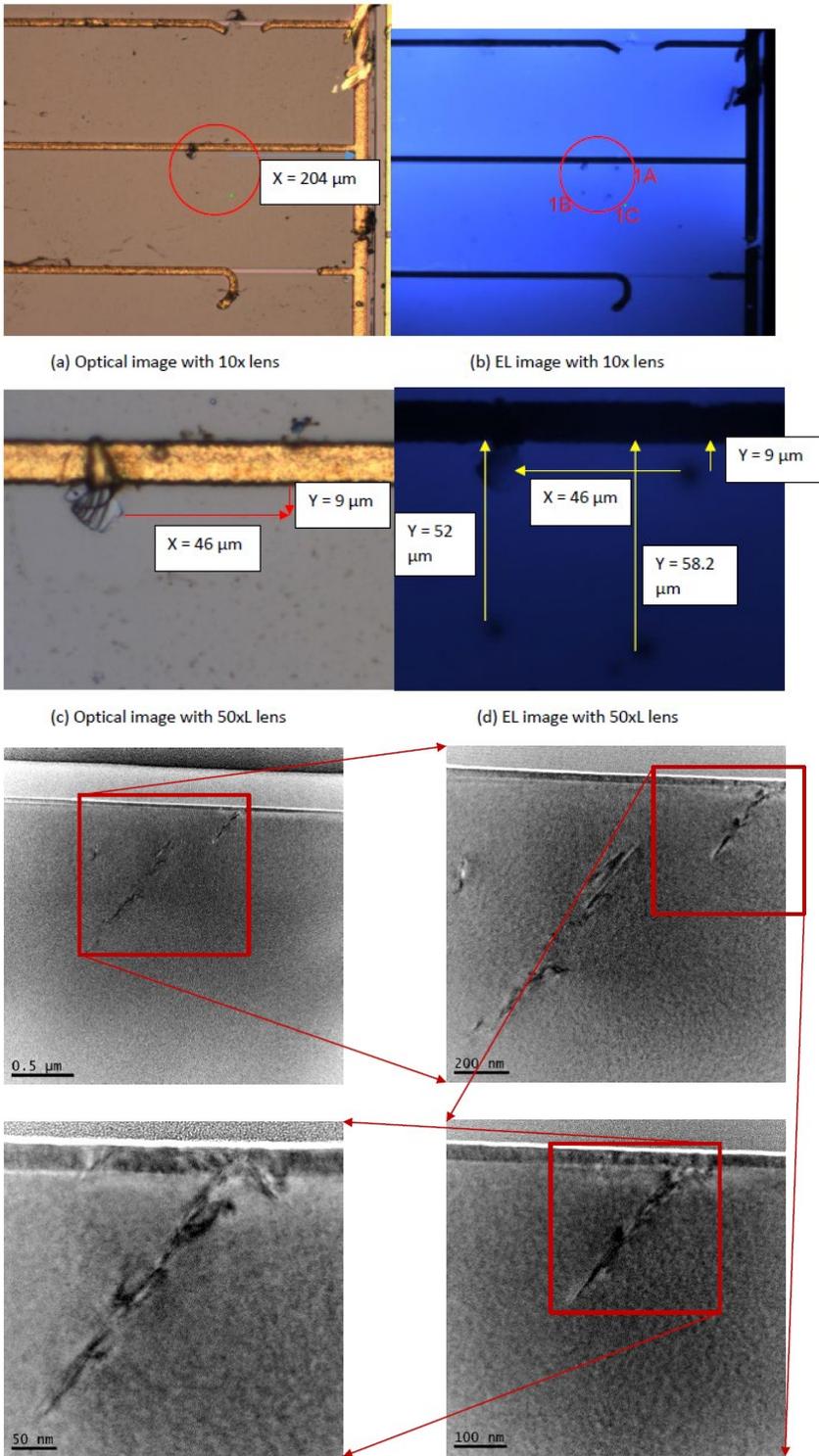


Fig. A7. TEM images of the defect 1B shown in the EL image. It consists of a cluster of defects, extending about 1.5 μm into the absorber layer.