Supporting Information

Preparation and Investigation of Micro-Transfer-Printable Single-Crystalline InP Coupons for Heterogeneous Integration of III-V on Si

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The thickness of the InP platelet was determined using IR-transmission spectra measured with a Lambda 1050 spectrophotometer (PerkinElmer). This method is based on measuring the interference fringes in the transmission spectra of the thinned platelet, with the incident beam being parallel to the surface normal. The interference fringes occur as a consequence of the superposition of the forward- and backwards-travelling electromagnetic waves due to reflexion at the smooth front and the back surface of the platelet. As the frequency of the interferences strongly depends on the thickness of the sample, the thickness of the platelet can be calculated using the wavelength dependence refractive index of InP between 1000 nm and 2500 nm as input parameter [1]. For the calculation, we have utilized a transfer matrix model, which accounts for the infinite number of reflexions described by the Fresnel equations [2]. Since only the frequency of the interference fringes are taken into account for the thickness quantification, we considered a free standing InP layer in vacuum (n = 1) for the sake of simplicity. Example see (Figure S1).

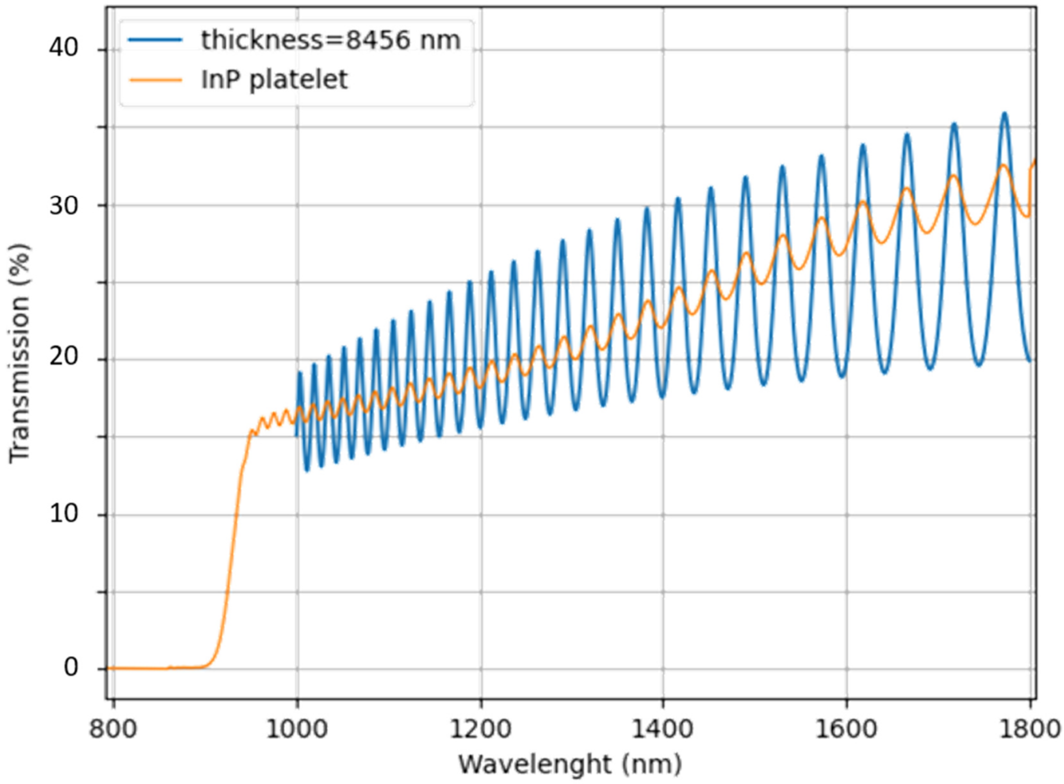

Figure S1. IR transmission of a thinned (001) InP platelet. The oscillation model shows an average thickness of 8.456 µm.

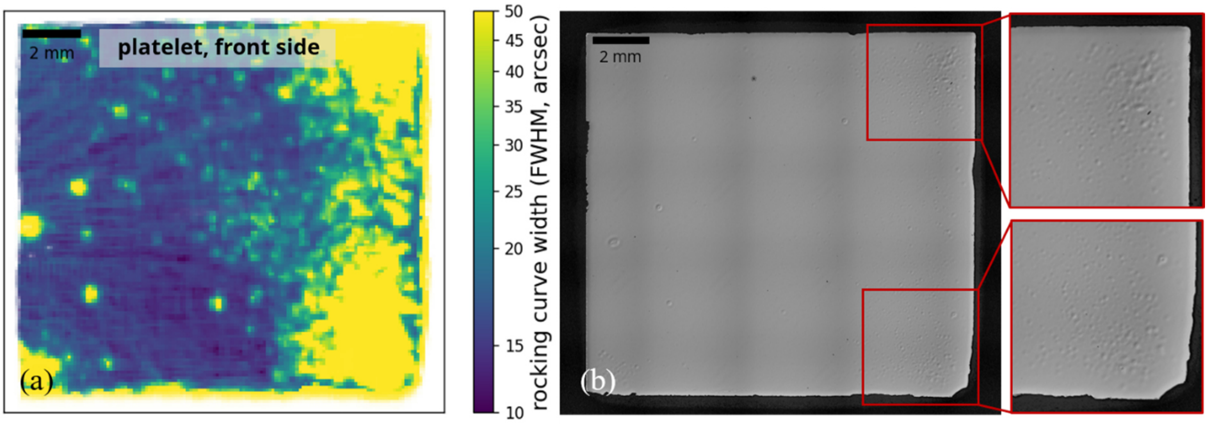

Figure S2. (a) Mapped rocking curve FWHM of a (001) InP platelet after thinning; and (b) DIC micrograph of the same sample, with the enlarged area showing the air bubbles trapped in the resin layer. The shadows are artefacts from stitching.

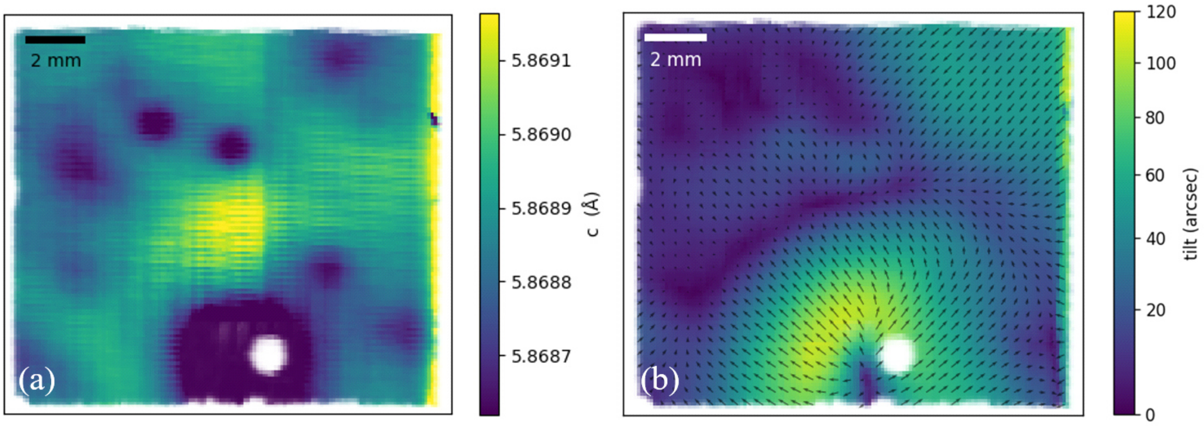

Figure S3. (a) Mapped lattice parameter of a (001) InP bulk sample, shadows are artefacts from stitching; and (b) tilt map of the same sample.

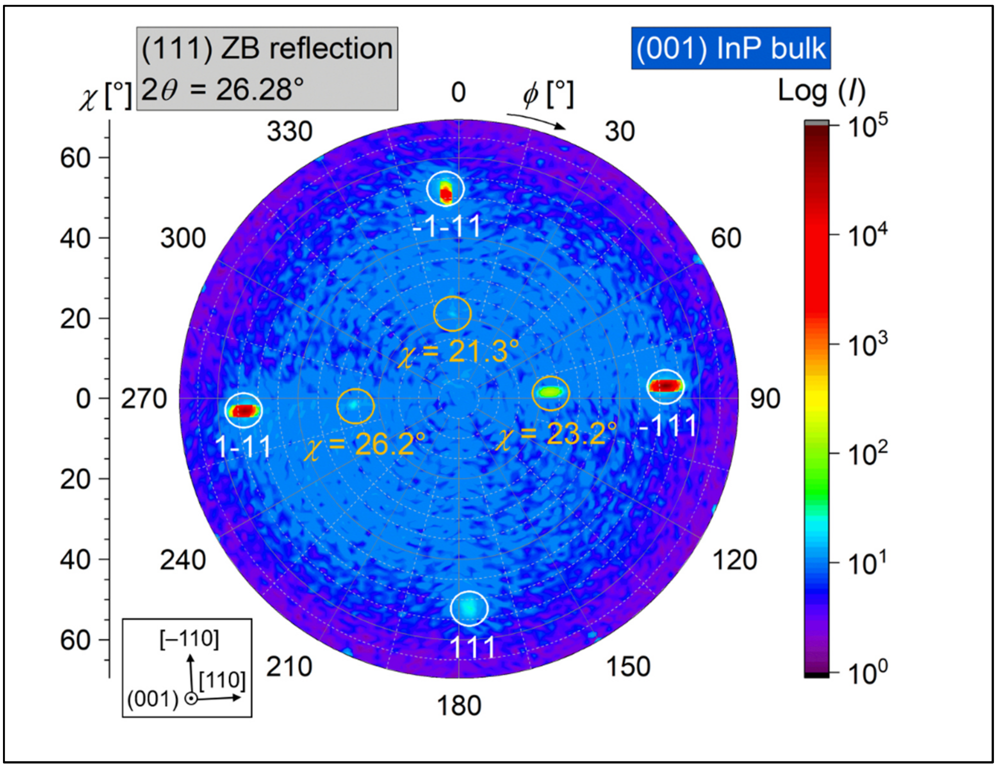

Figure S4. X-ray pole figure measured at $2\theta = 26.28°$ of the polished (001) InP bulk crystal, the sample orientation is indicated. The intensity (cps) is plotted on a logarithmic scale.

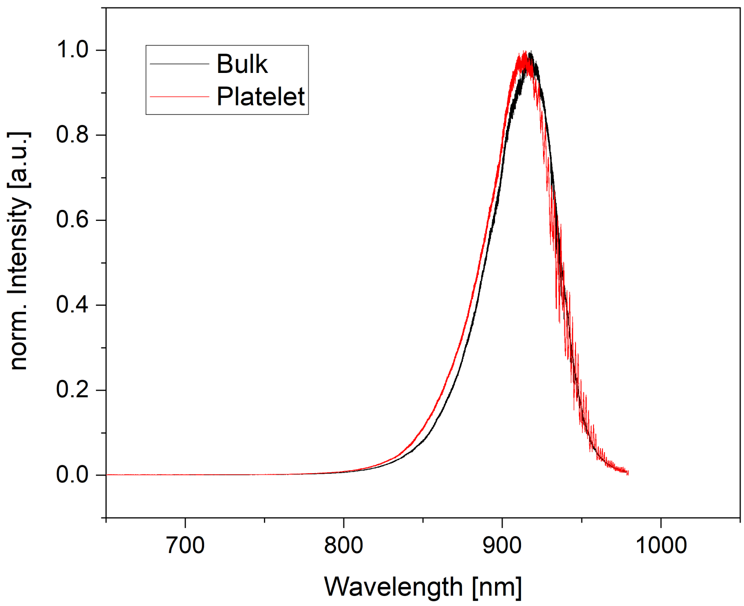

Figure S5. PL spectra from RT measurements on a polished bulk and thinned InP samples.

References:

[1] Adachi S. Optical dispersion relations for GaP, GaAs, GaSb, InP, InAs, InSb, AlxGa1−xAs, and In1−xGaxAsyP1−y. Journal of Applied Physics. 1989. 66 (12): 6030–6040. https://doi.org/10.1063/1.343580

[2] Byrnes S.J. Multilayer optical calculations. arXiv preprint arXiv:1603.02720. 2016. https://doi.org/10.48550/arXiv.1603.02720