**Supplementary material**
*Influence of etching material deposition rate and annealing time on nanohole morphology etched into InP/$In_{0.52}Al_{0.48}As$ layers via local droplet epitaxy*
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# 1 HRXRD

During this work we utilized HRXRD measurements to control the composition of our $In_{0.52}Al_{0.48}As$ layers grown lattice matched on InP. This is done by performing $\omega 2\theta$-scans along the symmetric $(400)$ InP reflex. By measuring the relative distance between the InP substrate and the $In_xAl_{1-x}As$ peaks the In concentration $x$ can be calculated. Fig. S1 shows an exemplary HRXRD measurement from one of the samples from this study, where InP and $In_xAl_{1-x}As$ overlap. We typically aim for In concentrations between 51.5 % and 52.5 %.

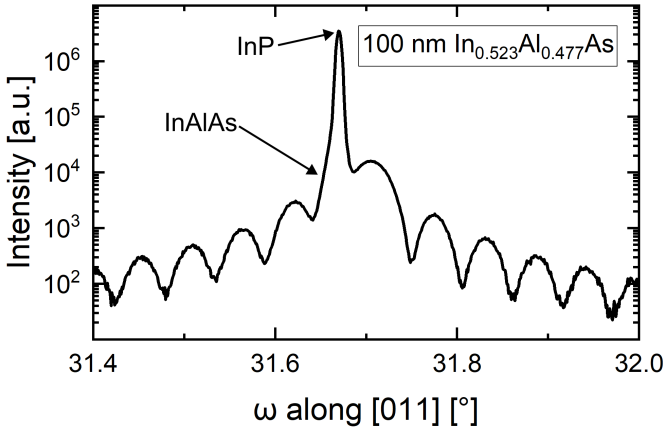


Figure S1: Exemplary $\omega 2\theta$-scan of the symmetric $(400)$ reflex of the sample $t_{etch} = 90\,\mathrm{s}$ from the etching time series with Al material deposition.