Supporting Information

Vertical arrays of nanofluidic channels fabricated without nanolithography

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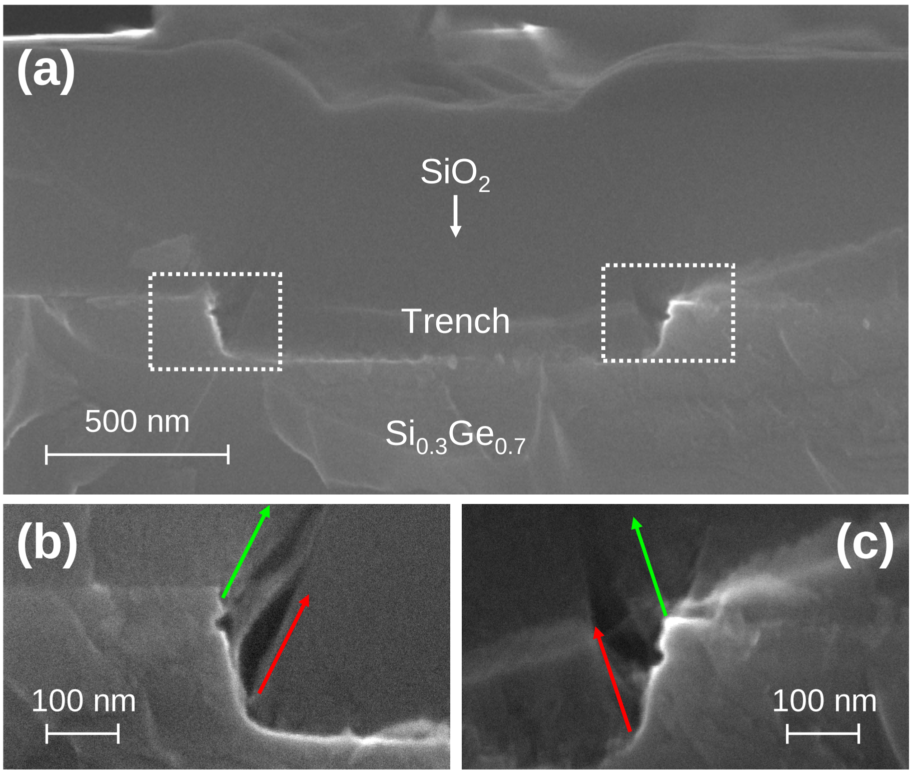

Figure S1: Scanning electron microscope (SEM) image of a single-nanochannel structure fabricated by selective side etching of a sacrificial layer and subsequent sealing of nanochannel by deposition of SiO_2 under an angle of incidence of 0°. The sample was cleaved perpendicularly to the channel axis prior to SEM imaging. (a) Two nanochannels were obtained by etching the heterostructure through a 1.2 μm wide opening in the resist. The deposition direction of the SiO_2 is marked by the white arrow. The nanochannels are magnified in (b) and (c). The cross-sectional size of the nanochannels is $\sim$ 15 nm $\times$ 19 nm. The damage in the SiO_2 cover close to the nanochannels is caused by a shadow effect. When SiO_2 is evaporated under an angle of incidence of 0°, it grows from the top edge of the sidewalls in the direction of the green arrows, as indicated in (b) and (c). This shadows the material which grows from the bottom of the trench which then deposits in the direction of the red arrows forming cracks in the cover (parasitic nanochannels) which run parallel to the nanochannel. Compare with Figure 2.7 from A.-L. Barabási and H. E. Stanley: 'Fractal Concepts in Surface Growth', Cambridge University Press (1995).

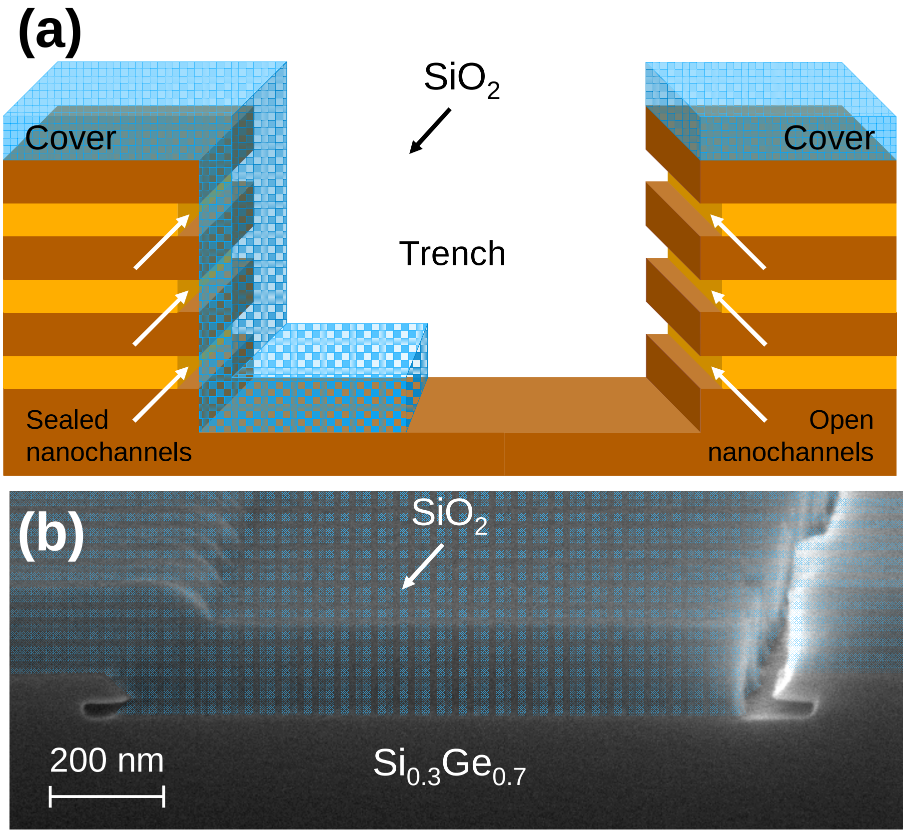

Figure S2: Elimination of cracks in the cover (in blue) by angle deposition forms open nanochannels. (a) Schematic drawing of a multi-nanochannel structure when a cover is deposited from an angle of incidence of 45° (in the direction of the black arrow). A consequence of angle deposition is that the shadow from the opposite sidewall of the trench prevents sealing of the nanochannels within this sidewall (open nanochannels). (b) SEM image of a single-nanochannel structure fabricated in a $Si_{0.3}Ge_{0.7}$/Ge heterostructure. The left nanochannel was sealed by evaporating 200 nm of SiO_2 under an angle of 45° (in the direction of the white arrow) which eliminates cracks in the cover close to the nanochannel (which can be seen in Figure S1). The nanochannel at the opposite side of the trench is not sealed.

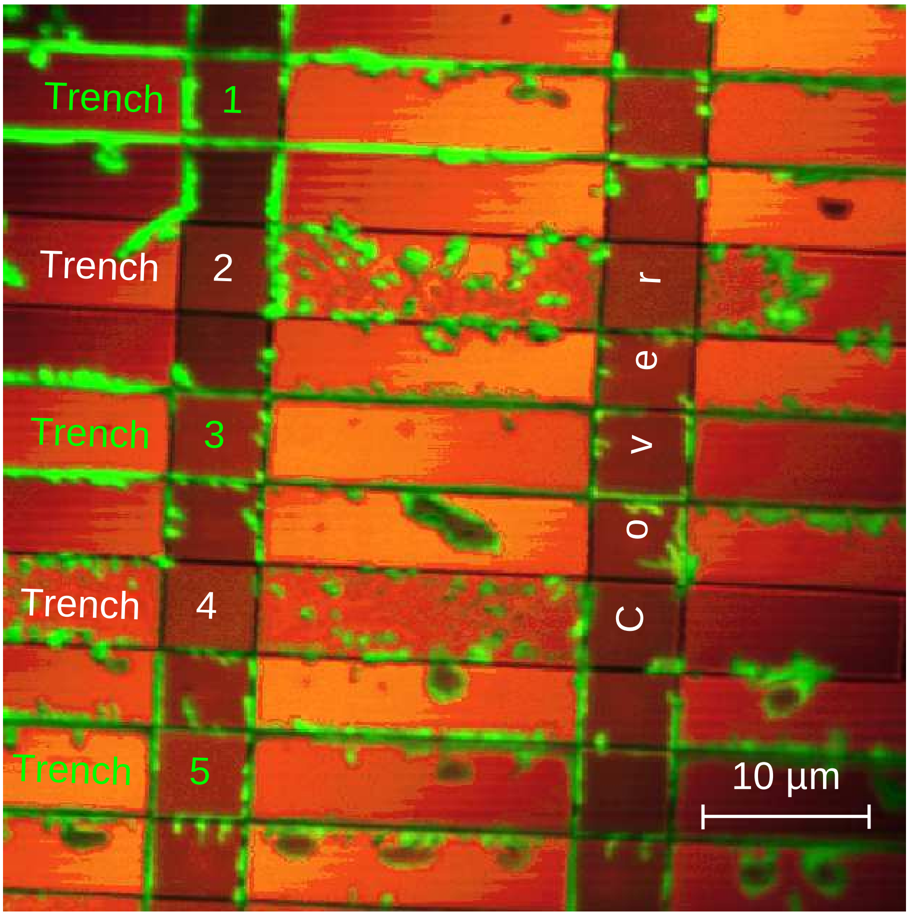

Figure S3: Overlay (reflection and fluorescence) image of a control single-nanochannel sample fabricated in a $Si_{0.3}Ge_{0.7}/Ge$ heterostructure. A nanochannel was etched only at the sidewalls of odd trenches (green labels). Even trenches (white labels) were fabricated after the odd trenches and do not have a nanochannel at the sidewalls. The nanochannels at the top sidewall of the odd trenches are sealed by 5 μm wide covers evaporated under an angle of 45°. The sample was first soaked in the staining fluorescent dye Sudan I and then blown dry prior to imaging. The top sidewalls of the trenches contribute to the fluorescence signal (displayed in green) only if there is a nanochannel within them, i.e., only in the case of the odd trenches. This confirms that the dye is located inside the nanochannels, i.e., below, not above the cover. The fluorescence can also be seen at the bottom sidewalls of the trenches emitted from the dye trapped in the opening in the cover, as seen at the right sidewall in Figure S2(b). In that case, the dye is trapped mostly in the odd trenches which have a nanochannel below the opening.