How can band offsets in III-V nanowires be determined correctly by scanning tunneling spectroscopy?

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Scanning tunneling spectroscopy (STS) allows the determination of band gaps and band offsets at interfaces between different polytypes or materials of III-V semiconductor nanowires (NWs). However, STS is mostly wrongly interpreted in literature: The commonly high step density at the sidewall surfaces of III-V NWs leads to extrinsic surface states that induce a pinning of the Fermi energy within the fundamental band gap. Since the pinning level is different on every polytype/material, the relative band edge positions between different NW segments are extrinsically determined. Therefore, we developed a new methodology to accurately determine band offsets between different NW segments by using a thin overgrown shell with wider band gap, assuring identical pinning of the overgrown and the pure segment.