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Towards Single-Electron Transport in Engineered Low-Dimensional Semiconductor Devices

Quantum electron pumps (QEPs) have become more popular as sources of precision current as the ampere is being redefined in terms of basic constants. As possible platforms for QEPs, this study investigates the fabrication and integration of engineered low-dimensional semiconductor materials, specifically silicon nanowires and C_{60} fullerene nanorods. Through a combination of nanofabrication techniques such as chemical vapour deposition (CVD) growth and electron beam lithography (EBL), this work focuses on synthesizing, characterizing, and preparing these materials for quantum transport applications. Although full low-temperature testing is ongoing, the study establishes a robust foundation for future quantised current measurements by addressing key fabrication challenges and integration strategies. The project ultimately contributes to the broader effort of advancing metrological standards using novel nanostructures.

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