

## **Theory of Spin Filtering in Non-Magnetic Resonant Tunneling Diodes**

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Recent theoretical studies suggest the possibility of polarizing electron spins by resonant tunneling, and obtaining spin-polarized current in resonant tunneling heterostructures. This mechanism offers the possibility of spin filtering without magnetic fields and using only conventional non-magnetic III-V semiconductor heterostructures. A typical resonant tunneling spin-filtering device structure consists of double barriers surrounding an asymmetric quantum well, where quantized states are spin-split by the Rashba effect. In this work we report our theoretical analysis of spin polarization effects in InAs/GaSb/AlSb resonant tunneling structures. We discuss the basic principles of the Rashba effect resonant tunneling spin filter, point out the challenges, and offer strategies for overcoming these difficulties. We will present spin-dependent current densities calculations, and discuss possible implementations of the resonant tunneling spin filters.