Split Gate Technology

What is split gate technology in Nano electronics?

- Forming quantum structures like quantum wire, dot, rings, etc, by splitting the different gates
- Two dimensional electrons are separated from the surface of the sample and confine them into a channel. If the two dimensional electrons can be quantized, we obtain a quantum wire, dot, rings, etc.

Split Gate Technology

- Using this method to form laterally confined nanostructure
- This forms an electrically controllable structure that can be adjusted by an applied voltage.

Forming Quantum Wire

- One starts with a two-dimensional electron gas, formed for instance, by a semiconductor heterostructure.
- Electrodes are deposited on top of the heterostructure.
- Left is unbiased.
- By applying the –ve voltage, the electrodes depletes the electron gas below the gate.
- So the gate electrodes form a narrow electron gas channel under the split.
- Resulting the Quantum Wire.

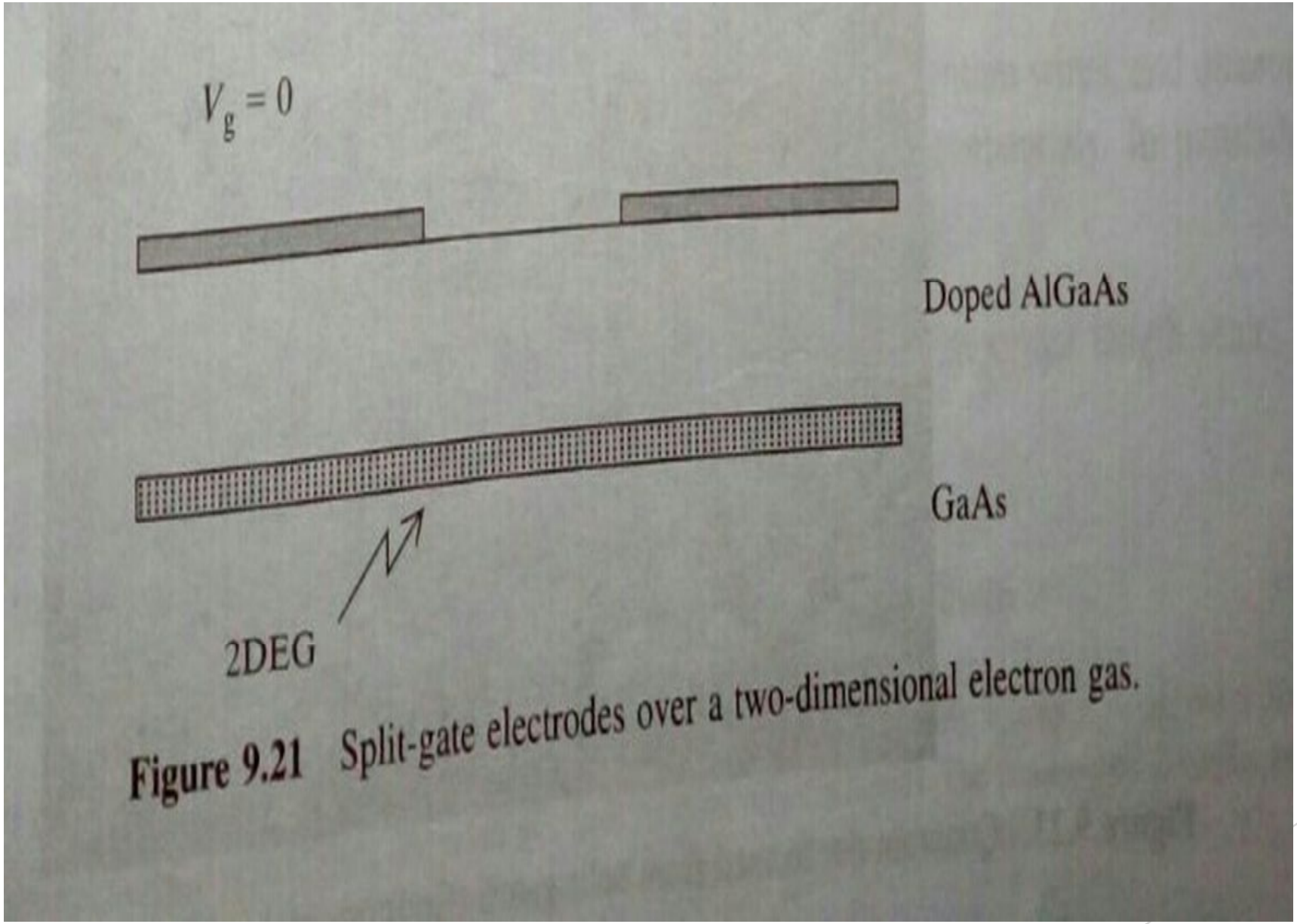
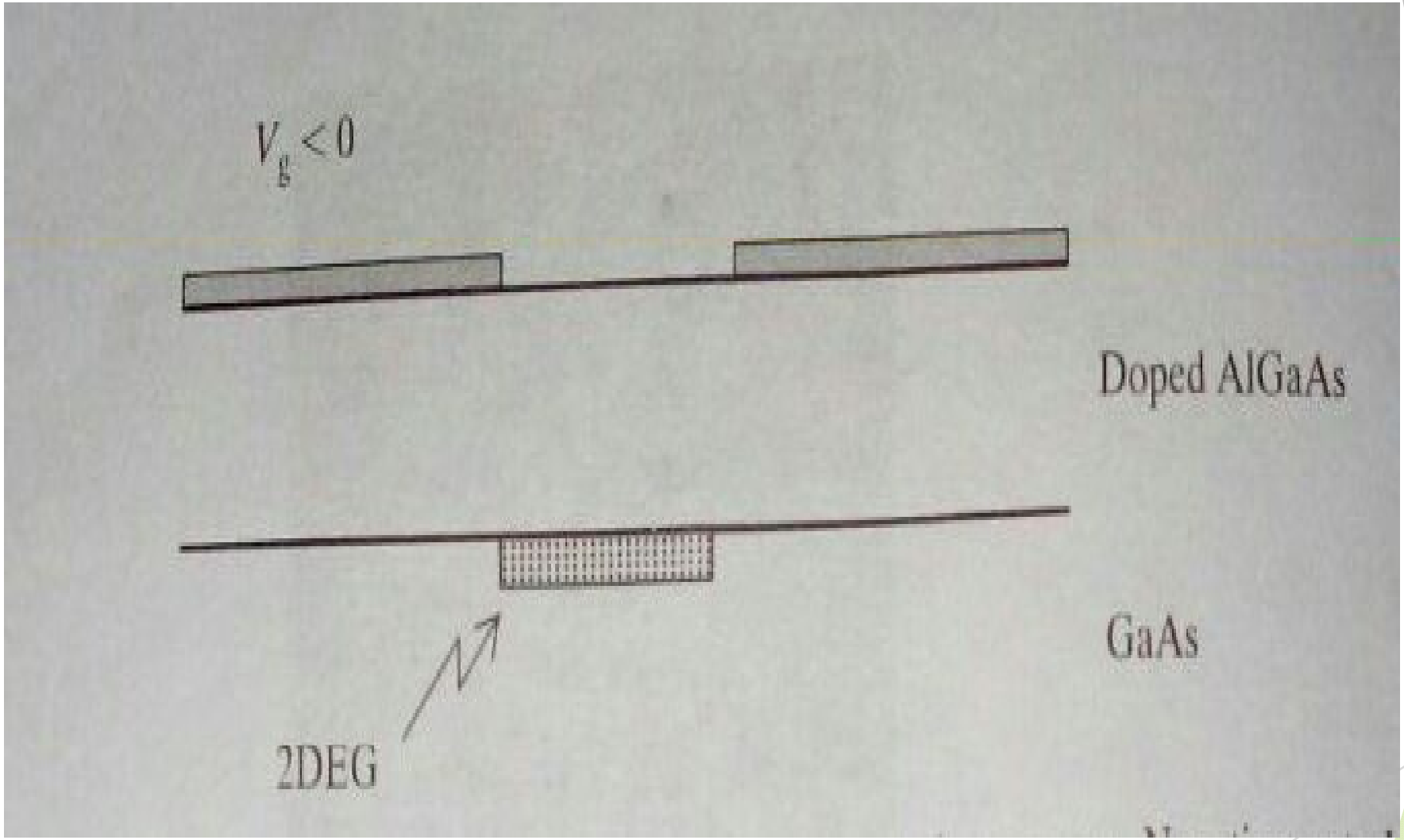


Figure 9.21 Split-gate electrodes over a two-dimensional electron gas.


$V_g < 0$
Doped AlGaAs
GaAs
2DEG

Quantum Dots

- It can also be fabricated in a similar manner.
- In the case of split gate quantum dot, the electrode pattern constraints the two dimensional electron gas formed by a heterojunction in the shape of a hole in the electrodes.
- Resulting a Quantum Dot.

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