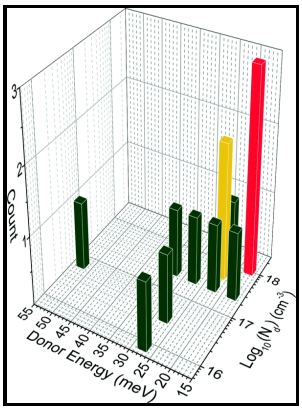
Shallow donors in n-type semiconductors

typescript - What is Donor in Semiconductors



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SHALLOW DONORS AND ACCEPTORS IN SEMICONDUCTORS

Carrier densities Chapter 2: Semiconductor Fundamentals 2. Solution Since the acceptor doping is much larger than the intrinsic density and much smaller than the effective density of states, the hole density equals: The electron density is then obtained using the mass action law The approach described in example 2. Either these impurities can be unintentional, due to lack of control during the growth of the semiconductor, or they can be added on purpose to provide free carriers in the semiconductor.

2.7 Doped Semiconductors

Most models describe the successive donor states by a sequential increase of the number of oxygen atoms involved in the donor centers. The temperature dependence at low temperatures is somewhat more complex as it depends on whether or not the material is compensated.

Donors in Semiconductors

Peaks due to exciton recombination are seen at 3. Since silicon is a tetravalent element, the normal crystal structure contains 4 covalent bonds from four valence electrons. Shown are the conduction and valence band edges, E C and E V, the intrinsic energy E i, the Fermi energy for n-type material, E Fn, and for p-type material, E Fp.

Shallow Donor

Compensation mechanism by intrinsic defects. In addition, one has to consider the temperature dependence of the effective densities of states and that of the energy bandgap.

What is Donor in Semiconductors

The Silicon atoms have four electrons in the valence shell. Deep impurities, which are more than five times the thermal energy away from either band edge, are very unlikely to ionize. The early infrared transmission study of hydrogen-like shallow donor impurity states in n-CdTe was reported by Cohn, Larsen and Lax see Figure 6.

What is Donor in Semiconductors

In an N-type semiconductor the electrons are greater in number and hence they are termed as the majority carriers and the holes are termed as minority carriers as they are less in number. This shifts the effective to a point about halfway between the donor levels and the conduction band.

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What is n

The numbers in Appendix 3 are obtained from careful measurements and should therefore be used instead of those calculated in example 2. As the Fermi energy is decreased, the electron density decreases and the hole density increases.

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