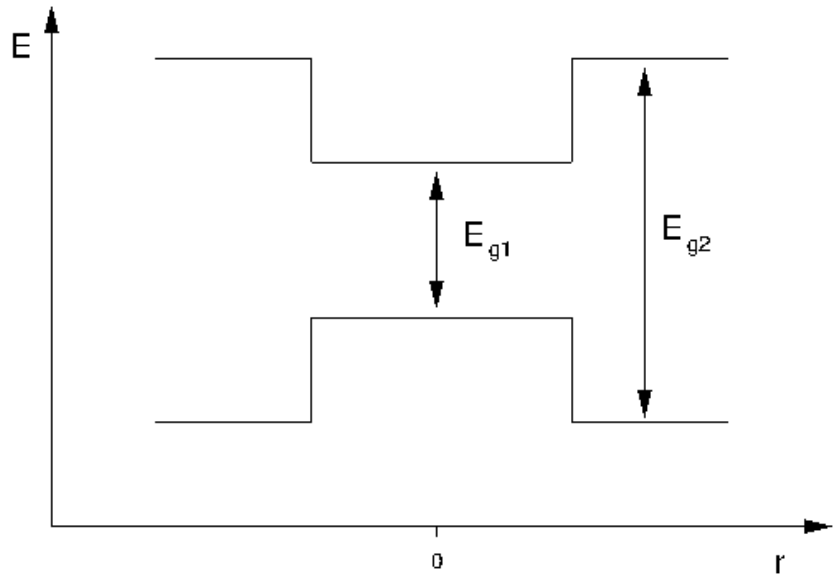

Figure 1.2: Schematic of a nanoscale crystal (quantum dot) embedded in a material of larger band gap energy. E_{g1} and E_{g2} refer to the band gap energies of the nanocrystal and host material, respectively.

can be minimised for such a system . It is assumed that the nanocrystal structure fits well with that of the host and that a minimum of additional interface states are produced. Ideally, this would mean that an electron promoted across E_{g1} from the valence band of the nanocrystal to its conduction band would remain confined within the nanocrystal. The electron would have no other choice than to fluoresce to the ground state because no discrete states are available within the gap.

To better account for non-radiative decay in real systems, vibrational relaxation is often considered. Because of the possibility of surface reconstruction, vibrational relaxation at surfaces is particularly important for free nanoscale crystals and clusters. Figure 1.3 illustrates the cycle of excitation, electronic migration and relaxation within the conduction band and vibrational relaxation at the surface. In this simple picture, a high density of vibrational states