

Er³⁺ Electronic Energy Levels in GaN

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December 1, 2008

Abstract

The $4f^{11} {}^4I_{13/2} \rightarrow {}^4I_{15/2}$ emission of Er³⁺ at 1.54 μm , particularly in a GaN host crystal, has been of interest in optical communications for some time due to its transmission efficiency and temperature stability. Theoretical treatments of this transition are complicated by the large number of open-shell electrons, moderate relativistic effects, and splittings due to the crystalline field. We have modeled the system as a cluster of ions centered on an Er³⁺ ion and have used spin-orbit configuration interaction to study the electronic states involved. It is an unusual quantum-theory problem in that single-excitation terms in the wave functions are of central importance.