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## Effect of Doping on the Optical Characteristics of Quantum Dot Semiconductor Optical Amplifiers

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**Abstract:** The influence of p-type and n-type doping on the optical characteristics of a quantum-dot semiconductor optical amplifier (SOA) is studied using a rate equation model that takes into account the effect of the multidiscrete energy levels and the charge neutrality relation. Our calculations show that the amplifier optical gain can be greatly enhanced through p-type doping where the doping concentration should not exceed the certain level. We find that increasing the acceptor concentration increases the unsaturated optical gain but at the same time decreases the saturation density and the effective relaxation lifetime. Also our calculation reveals that the use of p-type doping will be associated with an increase in the transparency current where the increase in the transparency current depends on the incident photon energy. On the other hand, we find that it is possible to increase the saturation density and enhance the linearity of the SOA by using n-type doping.