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Formulized analytical technique for gain characteristics of phosphate glass $\text{Er}^{3+}/\text{Yb}^{3+}$ co-doped waveguide amplifiers

Yu-Hai Wang, Chun-Sheng Ma, De-Lu Li, Da-Ming Zhang

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Keywords

waveguide amplifier, erbium-ytterbium co-dopant, rate equations, propagation equations, gain characteristic

Abstract

Novel formulas for analyzing the gain characteristics of the phosphate glass erbium-ytterbium ($\text{Er}^{3+}\text{-Yb}^{3+}$) co-doped waveguide amplifier (EYCDWA) are derived from the rate equations and the light propagation equations under the uniform dopant and steady-state conditions. In the derivation of these formulas, we have neglected the amplified spontaneous emission (ASE) and have introduced the initial energy transfer efficiency. By using these formulas, the effects of the pump power, signal power, dopant concentration and waveguide length on the gain characteristics of the EYCDWA are analyzed, the comparison is performed between the EYCDWA and the singly erbium-doped waveguide amplifier (EDWA), and some useful results are obtained.



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