Broad gain spectrum InAs/InP quantum-dot materials and their laser devices

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Broad gain spectrum light sources such as widely tunable semiconductor lasers are attractive for a wide range of applications including precision measurement, biomedical treatment, and environment monitoring. Furthermore, broadband lasers emitting in the 1.55 μm region are of great interest for fiber-optic communication applications such as dense wavelength division multiplexing system. Self-assembled quantum dots (QDs) grown in the Stranski-Krastanow mode are ideal candidates for broad gain spectrum medium, which usually have a large inhomogeneous broadening resulting from the random distribution of the QDs on their growth surface, e.g., the photoluminescence linewidth from the self-assembled InAs/InP QDs is typically greater than 200 nm [1]. This large inhomogeneous broadening is beneficial to broaden the gain spectrum of QD devices. In this talk, I will present our works on the development of broad gain spectrum InAs/InP QD materials and laser devices including ultra-broadband tunable InAs/InP QD external cavity lasers [2, 3], ultrashort pulse InAs/InP QD single-section mode-locked lasers with high output power [4, 5], and flat-topped ultrabroad stimulated emission InAs/InP QD lasers [6].

This work was supported by the National Natural Science Foundation of China (91433206 and 61574139).

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