Organic semiconductor distributed feedback (DFB) laser

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In this study, the lasing properties of a 4,4'-bis[(*N*-carbazole)styryl]biphenyl (BSBCz) [1] thin film under CW photoexcitation and electrical pumping are investigated. Present laser diodes are primarily based on inorganic semiconductors, but organics can also be an excellent gain media with unique device architectures. However, electrically driven organic semiconductor laser diodes have not yet been realized despite the advances in optically pumped organic semiconductor lasers. Here, we report out attempt of organic semiconductor laser diodes. The devices incorporate a mixed-order distributed feedback SiO_2 grating in an organic light-emitting diode structure and emit blue lasing (Fig. 1) and this device architecture allows lasing by optical-pump and direct injection of current into an organic thin film. It is critical to have a high-gain organic semiconductor layer showing clear separation of the lasing wavelength from significant triplet[2] and polaron absorptions and design of a proper feedback structure to suppress losses at high current densities. The organic-based laser diodes can cover the visible and near infrared spectra and a major advance toward future organic optoelectronic integrated circuits.

Fig. 1. Photographs of an OSLD under optical-pump and current injection.

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2. A. S. D. Sandanayaka, et al., *Science Adv*. 2017, **3**, e1602570.