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Toward Inversionless Laser
- exciton-polariton condensation insemiconductor microcavity -

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Typical semiconductor lasing is caused by the recombination of electron–hole plasma under a nonequilibrium condition without internal polarization. An exciton–polariton system with the same distributed Bragg reflector structure is expected to change to the usual semiconductor lasing mechanism under the nonequilibrium condition at a high excitation density far above the condensation threshold. Here, we report the observation of a photoluminescence sideband, which cannot be accounted for by conventional semiconductor lasing, but can be attributed to the coupling between photons and macroscopically coherent electron–hole pairs based on Bardeen–Cooper–Schrieffer physics. Our results imply that bound electron–hole pairs and the resulting strong coupling with the cavity photon field still exist at high excitation density, where polariton condensate observed at low density has changed its nature to the nonequilibrium one. In this talk, I review the inversionless lasing by an exciton polariton system in the semiconductor microcavity and discuss the lasing mechanisms based on our observation.

主催：九州大学 最先端有機光エレクトロニクス研究センター
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