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Electrical Spin Injection and Helicity Modulation in a Room Temperature Polariton Laser ANIRUDDHA BHATTACHARYA, MD ZUNAID BATEN, THOMAS FROST, PALLAB BHATTACHARYA, Univ of Michigan - Ann Arbor, IVAN IORSH, National Research University for Information Technology, Mechanics and Optics (ITMO), St. Petersburg 197101, Russia, ALEXEY KAVOKIN, School of Physics and Astronomy, University of Southampton, Southampton, SO17 1BJ, United Kingdom — Room temperature elliptically polarized inversionless coherent emission, or polariton lasing, is observed from a bulk GaN-based edge-emitting microcavity diode operated with spin-polarized electrical injection. The low nonlinear threshold for polariton lasing occurs at 69 A/cm^2 in the light-current characteristics, accompanied by a collapse of the emission linewidth to 1 meV and a blueshift of 1.87 meV of the emission peak. Sub-threshold angle-resolved measurements confirm strong-coupling regime of operation of the microcavity diodes (cavity Q = 3200) with a cavity-to-exciton detuning of – 11.6 meV and a vacuum-field Rabi splitting of 36.4 meV. Laser operation with a spin-polarized current, after in-plane magnetization, results in a maximum degree of output circular and linear polarization of 47 % and 33 % respectively, above the condensation threshold, at a field of + 1.6 kOe. The magnitude and helicity of the output circular polarization is deterministically governed by the in-plane H field. The results have been analyzed using the Gross-Pitaevskii equations for the spinor exciton-polariton condensate and the calculated results agree with the measured data.

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