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Graphene- and quantum well-based dipolariton nanodevices for integrated optical circuits GERMAN V. KOLMAKOV, New York City College of Technology CUNY, TIM BYRNES, New York University, ROMAN YA. KEZERASHVILI, New York City College of Technology CUNY — Application of dipolaritons, which are a quantum superposition of photons, direct excitons and indirect excitons, in an optical microcavity for the design of nanoscale devices for optical computing is considered. In the proposed setup, a dipolariton condensate is formed in a patterned microcavity with an embedded two-layer gapped graphene. The condensate propagates in quasi-one dimensional channels formed by the pattern, and its propagation is controlled by the gate voltage applied to a positively-charged hole-carrying graphene layer. The advantage of the dipolartions, compared to the conventional polaritons formed by the direct excitons and photons, is in the possibility to drive the condensate by the electric force since the latter is directly applied the dipolaritons. A dipolariton switch based on a Y-shaped channel is considered and its performance is determined via numerical simulations of the dipolartion condensate dynamics. The tunability of the device functions by the application of an external electric field is discussed. The simulations for a Y-shaped switch is also performed for a patterned microcavity with embedded coupled quantum wells and the results are compared with those for a microcavity with graphene.

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