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On high-temperature superfluidity of the two-component exciton gas in a TMDC bilayer ROMAN YA. KEZERASHVILI, OLEG L. BERMAN, New York City College of Technology, The City University of New York — The high-temperature superfluidity of two-dimensional dipolar excitons in a TMDC bilayer was predicted. The exciton effective mass, energy spectrum of the collective excitations, the sound velocity and mean-field phase transition critical temperature were obtained for different TMDC materials. Bose-Einstein condensation in the two-component weakly-interacting gas of dipolar A and B excitons was studied. Within the Bogolubov approximation, the sound velocity in the two-component dilute exciton Bose gas is always larger than in any one-component one due to the fact that the sound velocity for a two-component dilute exciton gas system depends on the reduced mass of A and B excitons, which is always smaller than the individual effective mass of A or B exciton. Due to this difference between the reduced and individual effective exciton masses, the critical temperature for superfluidity for the two-component exciton system in a TMDC bilayer is about one order of magnitude higher than one in any one-component exciton system. The observation of the superfluidity of two-dimensional dipolar excitons in a TMDC bilayer causes two opposite superconducting currents in each TMDC layer which can be observed experimentally.

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