Hot Topics in Cold Gases
—A Mathematical Physics Perspective

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Abstract

We present an overview of mathematical results on the low temperature properties of dilute quantum gases, which have been obtained in the past few years. The presentation includes a discussion of Bose–Einstein condensation, and focuses on the excitation spectrum for trapped gases and its relation to superfluidity, as well as the appearance of quantized vortices in rotating systems. All these properties are intensely being studied in current experiments on cold atomic gases. We will give a brief description of the mathematics involved in understanding these phenomena, starting from the underlying many-body Schrödinger equation.