

Wetting Phase Transitions in Bose-Einstein Condensate Mixtures

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The possibility of wetting phase transitions in Bose-Einstein condensed gases is predicted on the basis of Gross-Pitaevskii theory [1]. The set-up is a binary mixture of Bose-Einstein condensates adsorbed at an optical wall. The surface of this system can undergo a first-order wetting phase transition upon varying the interparticle interactions, represented by atomic scattering lengths. These scattering lengths can be tuned experimentally using, e.g., Feshbach resonances. Interesting ultralow-temperature effects shape the wetting phase diagram. The prewetting transition is, contrary to general expectations, not of first order but critical, and the prewetting line does not meet the bulk phase coexistence line tangentially. Experimental verification of these extraordinary results is called for, especially now that it has become possible, using optical methods, to realize a planar “hard wall” boundary for the condensates.

[1] J.O. Indekeu and B. Van Schaeybroeck, *Phys. Rev. Lett.* **93**, 210402 (2004).