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Experimental Phase Diagram of the $\nu = 1/2$ Bilayer Electron System KOJI MURAKI, NTT Basic Research Laboratories — Experimental phase diagram of the bilayer electron system at total filling $\nu = 1/2$ is investigated through magnetotransport measurements on a series of double-quantum- well samples with different tunneling gap Δ_{SAS} and tunable densities. A $\nu = 1/2$ fractional quantum Hall (QH) effect is observed over a wide, and previously unexplored, region of the phase diagram described by the interlayer tunneling and layer distance. The $\nu = 1/2$ QH liquid phase in our double quantum wells is connected to the region where the $\nu = 1/2$ QH effect is reported for wide single quantum wells and is bounded by a compressible composite-Fermion liquid phase at lower densities and by an insulating phase at higher densities. Furthermore, we find a striking impact of the interlayer tunneling on the competition between the QH liquid and the insulating phases; the QH phase is taken over by the insulating phase in the limit of small tunneling, suggesting a crucial role of tunneling on the stability of a bilayer Wigner crystal.

Koji Muraki
NTT Basic Research Laboratories

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