Possible Phase Diagram of Imperfect Bose Liquid in Nanoporous Glass

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Experimentally, a quantum phase diagram suggestive of a normal liquid ground state or a quantum critical point of the superfluid transition has been argued for the dense ^{4}He confined in nanoporous media[1] . However, the argument on a normal bose liquid at zero temperature should be reconsidered. Here we study effects of quenched disorder stemming from the structure of the porous material on the bose superfluid transition depressed by the quantum phase fluctuation and find that, reflecting the presence of the bose glass[2] at zero temperature but at higher pressures, the superfluid region is enhanced at low enough temperatures. Further, we also consider effects of dilute ^{3}He atoms on the bose superfluid transition, and, even in this case, it is found that, at low enough temperatures, the ^{3}He gas enhances the bose superfluidity.

1. K. Yamamoto, Y. Shibayama, and K. Shirahama, Phys. Rev. Lett. **100**, 195301 (2008).
2. M. P. A. Fisher et al., Phys. Rev. B **40**, 546 (1989).

Section: LD - Low dimensional and confined systems

Keywords: superfluid ^{4}He, quantum phase fluctuation, bose glass