T_CSUH Special Seminar

Texas Center for Superconductivity at the University of Houston

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"Supersolid Phase in Spin Dimer XXZ Systems under Magnetic Field"

Wednesday, May 10, 2006
Room 634, Science and Research 1
4:00 p.m. – 5:00 p.m.

Abstract

Using quantum Monte Carlo method, we study, under external magnetic fields, the phase diagram of the two-dimensional spin S=1/2 dimer model with an anisotropic intra-plane antiferromagnetic coupling. With a reaonable size of anisotropy, a supersolid phase with both finite checkerboard structure factor and superfluid density is found. We demonstrate that the supersolid phase is characterized by a non-uniform bose condensate density that breaks translational symmetry. The rich phase diagram also contains a checkerboard solid and two different types of superfluid phase formed by S_z=+1 and S_z=0 spin triplets, with finite staggered magnetization in z-axis and in-plane direction, respectively. As we show, the model can be realized as a consequence of including the next nearest neighbor coupling among dimers and our results suggest that spin dimer systems may be a more natural place to look for supersolids.

Bio

T. K. Lee received the B.S. degree from National Taiwan University (Taipei) in 1971, and the Ph.D. in Physics from Brown University in 1975. He was a Research Associate in the Department of Physics at City College of City University, New York from 1975 to 1979, and at the Institute for Theoretical Physics at the University of California at Santa Barbara from 1979 to 1981. He was Assistant Professor and Professor of Physics at Virginia Polytechnic Institute and State University, Blacksburg, VA, from 1982 to 1997. In 1996, he became a Research Fellow at the Institute of Physics, Academia Sinica in Taipei, and in 1997, also became Head of the Physics Division, National Center for Theoretical Sciences, Hsinchu, Taiwan. From 1997 to 2002, he was Outstanding Scholarship Chair. Dr. Lee's research interests include high temperature superconductivity, nano-materials, X-ray crystallography, protein structure, protein folding, and Quantum Monte Carlo method.

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