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Torsional Oscillator Studies on Solid Helium[1] DUK Y. KIM, MOSES H.W. CHAN, Department of Physics, Pennsylvania State University — In 2004, the series of torsional oscillator (TO) experiments by Kim and Chan initiated considerable research activities on the supersolidity of helium. However, recent experiments in rigid torsional oscillators which reduce the effect of stiffening of bulk solid helium at low temepratures showed very small or negligible changes in the resonant period. A new TO experiment of solid helium confined in porous Vycor glass with no bulk solid helium in the sample cell show no evidence of supersolidity [1]. Moreover, we have repeated an earlier experiment [2] on hcp ^{3}He solid, which shows similar low temperature stiffening like hcp ^{4}He. We found that the small drop of the resonant period measured in the hcp ^{3}He samples is comparable to that measured in the hcp ^{4}He samples. These results confirm that the resonant period drops in torsional oscillators are consequence of the shear modulus stiffening effect in solid helium. Remaining issues and open questions on the supersolidity will be discussed.

[1] D. Y. Kim and M. H. W. Chan, Phys. Rev. Lett. 109, 155301 (2012)
[2] J. T.West, O. Syshchenko, J. Beamish, and M. H.W. Chan, Nature Phys. 5, 598 (2009)

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Duk Y. Kim
Department of Physics, Pennsylvania State University

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