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Enhancement of superconductivity by parallel magnetic field in ultrathin a-Pb films. ASHWANI KUMAR, H. JEFFREY GARDNER, PENG XIONG, Department of Physics and MARTECH, Florida State University — A modified dilution refrigerator equipped with *in situ* film growth and a rotating sample stage is used to study the effect of magnetic field on ultrathin homogeneous Pb films. An insulating layer of Sb ($\sim$ 1 nm) is first deposited to ensure electrical and possibly structural uniformity down to a single atomic layer for the subsequently deposited Pb. Through incremental deposition of Pb, a film with increasing thickness (thus decreasing R and increasing T_C) is obtained and transport measurements in perpendicular and parallel magnetic field are performed *in situ* at different film thicknesses. Any *perpendicular* field is found to suppress superconductivity, and at sufficient strength induces an electrically inhomogeneous insulating state.[1] In contrast, the same film is at least two orders of magnitude less sensitive to a *parallel* field. More strikingly, a moderate parallel magnetic field actually *increases* the T_C of the film, resulting in large negative magnetoresistance in the transition region in parallel fields as large as 3T. The dependence of this effect on the film thickness, impurities and temperature will be presented and discussed. [1]J.S. Parker et al., Europhys. Lett. 75, 950 (2006).

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