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Size dependent superconductivity of nano-sized Pb islands studied by low temperature scanning tunneling spectroscopy under magnetic field TAKAHIRO NISHIO, MASANORI ONO, TOYOAKI EGUCHI, The Institute for Solid State Physics, The University of Tokyo, HIDEAKI SAKATA, Department Physics, Tokyo University of Science, YUKIO HASEGAWA, The Institute for Solid State Physics, The University of Tokyo — We performed scanning tunneling microscopy/spectroscopy at low temperature (<2 K) on atomically-flat nano-sized Pb islands formed on the Si(111)- 7×7 substrate. The measured tunneling spectra revealed that the superconducting gap does not depend on the sites in a single Pb island but depends on the lateral size of islands. These are consistent qualitatively with the results of a theoretical calculation which includes the fluctuation of superconductivity[1]. We also investigated superconductivity of Pb islands under magnetic fields up to 2.1 T. The superconducting gaps were still observed above the critical magnetic field of bulk Pb. In addition, the obtained spectra showed the decrease in the conductance at zero bias voltage when the island size is small. The conductance decrease can be explained with Gor'kov equations on superconducting spheres whose size is smaller than the coherence length. [1] T. Nishio *et al.*, APL **88**, 113115 (2006).

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