Title: Impurity Effects in BiS$_2$–Based Layered Superconductors

Abstract:
In BiS$_2$-based layered superconductors [1], angle-resolved photoemission spectroscopy measurements have suggested the existence of gap nodes on Fermi-surface curves [2], whereas the conventional s-wave gap has been proposed from measurements of superfluid density [3] and thermal conductivity [4]. To reconcile these two distinct experimental results of the gap node, we investigate nonmagnetic impurity effects in the superconductor with a disconnected pocketlike Fermi-surface structure [5]. We claim that the seemingly contradictory situation concerning the gap node is resolved by a concept of dirty nodal extended s-wave superconductivity. Provided that it is unnecessary to consider the nodes of the gap, at first glance, the conventional s-wave gap seems to be a unique solution, but in the pocketlike Fermi-surface topology, a nontrivial possibility of a nodeless d-wave superconductor is pointed out. To clarify the gap symmetry, we propose to perform experiments on nuclear magnetic relaxation rate $T_1^{-1}$ in BiS$_2$-based layered superconductors.