STM Spectroscopy on deuterated κ-(BEDT-TTF-d[n, n])$_2$Cu[N(CN)$_2$]Br

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We performed the STM Spectroscopy measurements on deuterated κ-(BEDT-TTF-d[n, n])$_2$Cu[N(CN)$_2$]Br to clarify the relation between the superconducting state and the strength of electron correlation in organic superconductors BEDT-TTF family. It is predicted by the spin fluctuation mechanism that the node direction of d-wave superconducting gap changes depending on the dimerization in d[n,n]-Cu[N(CN)$_2$]Br corresponding the electron correlation. We report the results for d[2,2]-Cu[N(CN)$_2$]Br and d[3,3]-Cu[N(CN)$_2$]Br with the stronger electron correlation than d[0,0]-Cu[N(CN)$_2$]Br. We investigated both the conducting plane and lateral surfaces in the STM measurement. The superconducting gap observed as the differential conductance on conducting plane (a-c plane) has a V-shape functional form, and is explained by the line nodes model with d-wave symmetry. In addition, the gap varied systematically depending on the direction of lateral surface. From the analysis of angular dependent gap function we found that the node direction of d-wave in d[2,2]-salt is along $a^* \pm c^*$ same as d[0,0]-salt. We also found that the node direction in d[3,3] is about $a^* \pm c^*$ direction. These directions are confirmed by the observation of ZBCP at the lateral surface near node direction. It suggests that the dimerization in d[2,2] and d[3,3] is still weak although these salts are situated near Mott boundary. While, the results of d[3,3]-salt with larger dimerization suggest that the node direction rotates toward a little to the c^* axis.