

Zn impurity effect on $\text{Ca}_{2-x}\text{Na}_x\text{CuO}_2\text{Cl}_2$ near the hole concentration of $1/8$ per Cu

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It is established that the suppression of local T_c and development of charge and spin stripe order occurs near the hole concentration $p \sim 1/8$ in $\text{La}_{2-x}\text{Ba}_x\text{CuO}_4$ and $\text{La}_{2-x-y}\text{Nd}_y\text{Sr}_x\text{CuO}_4$. However, such a “ $1/8$ anomaly” is not observed in $\text{Ca}_{2-x}\text{Na}_x\text{CuO}_2\text{Cl}_2$ (Na-CCOC) that has a similar structure but distinct from La214 system by the flat CuO_2 planes. We have performed muon spin relaxation (μSR) measurements on a series of Na-CCOC samples including those with Cu partially substituted by Zn to investigate magnetic ground state over a hole concentration range near $1/8$. We found a clear magnetic anomaly in Zn substituted samples. As shown in Fig. 1, an exponential relaxation signal was observed at $T \sim 2$ K. This indicates that a small amount of Zn ($S=0$) impurity leads to slowing down of neighboring Cu ($S=1/2$) spins. The observed tendency is similar to the cases of $\text{La}_{2-x}\text{Sr}_x\text{CuO}_2$, Bi2212, and Y123 systems, and thereby suggesting that $1/8$ anomaly is one of the common features among hole-doped cuprate superconductors irrespective of the flatness of CuO_2 planes.

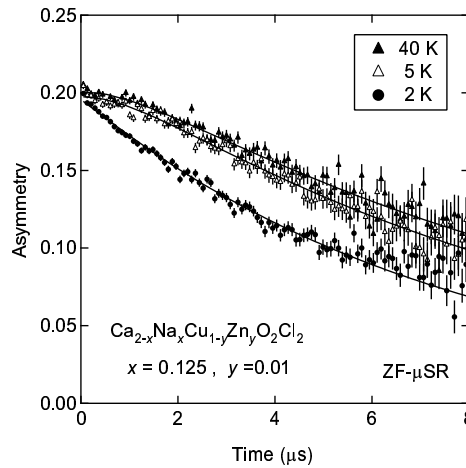


Fig. 1: ZF- μSR time spectra in a Zn-substituted sample.

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