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Spin dynamics studied of structurally perfect S=1/2 Kagome antiferromagnet $ZnCu_3(OH)_6Cl_2$ by high frequency ESR

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The possible realization of a spin-liquid state in $ZnCu_3(OH)_6Cl_2$, which is called *perfect S=1/2 Kagome AF lattice [1]*, has attracted much recent attention. There are many candidate materials were investigated as possible system of a Kagome lattice for the last decade. However, they mostly exhibit a magnetically ordered or spin-glass-like state at low temperatures. On the other hand, the new Kagome lattice substance $ZnCu_3(OH)_6Cl_2$ does not show magnetic long range order or spin freezing in the magnetic susceptibility [2, 3], the specific heat [3], the neutron scattering [3], μSR [4, 5]. These data established that $ZnCu_3(OH)_6Cl_2$ remains paramagnetic down to 50 mK. Recently, NMR [6] measurements point out that the local spin susceptibility develops a large distribution below 125K. Low frequency spin fluctuations grow toward T=0 without the signature of a critical slowing down.

Our aim is to investigate the spin susceptibility and the spin fluctuations of perfect S=1/2 Kagome AF magnet by probing the electron spin dynamics directly using ESR. The high frequency ESR measurements of $ZnCu_3(OH)_6Cl_2$ powder sample have been performed from 300 to 1.8 K.

Although we treat powder sample, a single absorption line is observed. There are no g-shift observed in the temperature range from 300 to 1.8 K. Temperature dependence of the linewidth is almost constant for measured temperature. These behaviors are similar to paramagnet. On the other hand, a famous Kagome AF system SCGO shows g-shifts and linewidth broadening as the temperature decreases [7]. We will discuss the possible realization of a spin-liquid state in Kagome lattice from ESR point of view.

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