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The electron transfer channel in the sugar recognition system assembled on nano gold particles

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The recently reported electrochemical sugar recognition system consisting of a nano-sized gold particle (GNP) with a diameter of 10 nm, a ruthenium complex and a pheylboronic acid, attracts much interest because of its high sensitivity for various sugars such as D-glucose or D-fructose. When sugar molecules are attached to the phenylboronic site, the response of electrochemical voltammetry of the Ru site changes, enabling the system to work as a sensitive sugar-sensor [1]. In this recognition process, the change in the electronic state at the boron site caused by sugar must be transferred to the Ru site. However, mechanisms of its transfer as well as the sensitivity amplification are not understood until now [2].
We have utilized the method of labelled electrons with muons and also the proton NMR to find out a channel of the electron transfer from the phenylboronic acid site to the gold nano particle via the one dimensional alkyl chain. If this transfer is driven by diffusive spin channel, characteristic field dependence is expected in the longitudinal spin relaxation rate of muSR and 1H-NMR[3,4]. We have observed significant decrease in the spin relaxation rates with increasing applied longitudinal field between 0.1 and 6 T for muSR and 1H-NMR. The result will be discussed in terms of low dimensional spin diffusion along alkyl chains.

References:
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