**Perspectives in Multi-Functional Single-Molecule Magnets and Single-Chain Magnets**

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Recently, the quantum molecular nano-magnets have been attracting much attention based on the basic sciences as well as the applied sciences such as memory storages, quantum computers, etc. So far 20 type of single-chain quantum magnets have been reported. Among them, we have synthesized 10 types of single-chain quantum magnets so far. More recently, we have synthesized the novel single-chain quantum magnet formed by a twisted arrangement of easy XY-plane magnetic anisotropy (D>0) for the first time. The compound consists of an alternating high-spin Fe(II) and low-spin Fe(III) mixed-valence chain complex, *catena*-$[Fe^{II}(ClO_4)_2\{Fe^{III}(bpca)_2\}]ClO_4.3MeNO_2$. The compound shows the photo-induced switching between a single-chain quantum magnet and a paramagnetic state reversibly for the first time by irradiation of the mixed-valence charge transfer band from Fe(II) to (Fe(III). This shows the reversible absorption and desorption of $3MeNO_2$ crystalline solvents, which is accompanied by the change of the magnetic behaviours and is the first sponge quantum single-chain magnet. Moreover, this shows the semi-conducting behaviour . More recently, we have succeeded to synthesize conducting single-molecule quantum magnets such as $[Mn_4(hmp)_6(MeCN)_2][Pt(mnt)_2]_6$ and $[Mn_2(5\text{-}MeOsaltmen)_2(MeCN)_2]$ $[Ni(dmit)]_7$. 4(MeCN). These show the semi-conducting behaviors. We have accessed to one single-molecule magnet of $Pc_2Tb$ by STM. We have observed “Kondo peak” in it by STS. We have a plane to input one memory into one single-molecule magnet and output from one single-molecule magnet.

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