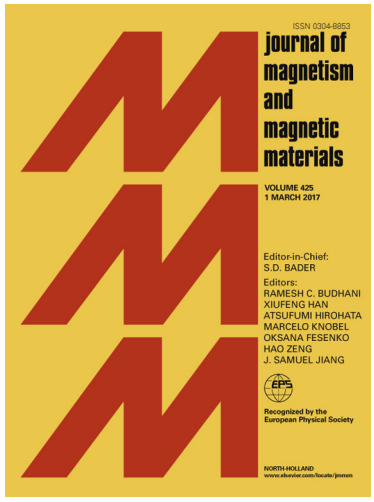


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# Ageing effects on the magnetic properties of $Mn_{12}$-based Acetate and Stearate SMMs

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## Abstract

A study of ageing effects on the magnetic properties of Single-Molecule-Magnets (SMMs) of the $Mn_{12}$ based Acetate, ($[Mn_{12}O_{12}(CH_3COO)_{16}(H_2O)_4].2CH_3COOH.4H_2O$ (**1**) and Stearate, $[Mn_{12}O_{12}(CH_3(CH_2)_{16}COO)_{11}(CH_3COO)_5(H_2O)_4]$ (**2**) complexes has been carried out. Detailed magnetization (M) measurements as a function of temperature (T ~ 1.8 to 10 K), magnetic field (H ~ 0 to ±40 kOe) and time (t) have been performed on relatively fresh samples (**1A** and **2A**) and samples aged for ~ 4 weeks (**1B** and **2B**) of both $Mn_{12}$-Acetate and $Mn_{12}$-Stearate. The blocking temperatures ($T_B$) extracted from the measured M(T) lie between ~ 3.0 – 3.4 K for all the four samples. In all cases, below $T_B$, the M-H loops exhibit hysteresis with periodic steps. Interestingly, the ageing process leads to significant changes in the magnetic response of both the complexes. With ageing the $Mn_{12}$-Acetate exhibits a large increase in the magnetization drop near zero-field, but the estimated anisotropy energy barrier ($U$) remains unchanged ~ 71 K. Whereas, in the case of $Mn_{12}$-Stearate ageing results in a change of $U$ from ~ 52 K (**2A**) to ~ 35 K (**2B**). The results are discussed in terms of possible ageing induced changes in the structural and chemical environment of the SMMs.

*Keywords*: magnetization, magnetic materials, $Mn_{12}$-Acetate, $Mn_{12}$-Stearate, SMM, ageing