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Magnetic properties of a new one-dimensional vanadium oxide with the hollandite structure NATASHA A. CHERNOVA, J. KATANA NGALA, PETER Y. ZAVALIJ, M. STANLEY WHITTINGHAM, INSTITUTE FOR MATERIALS RESEARCH, SUNY AT BINGHAMTON, BINGHAMTON, NY 13902 TEAM — The magnetic properties of the first hollandite-type vanadium oxide $V_{7.22}O_8(OH)_8(Cl)_{0.77}(H_3O)_{2.34}$ containing anions in the tunnels are studied. The temperature dependence of the static magnetic susceptibility reveals a magnetic phase transition at about T_c=20 K. Below this temperature, field-cooled and zero-field-cooled susceptibilities diverge. The temperature dependencies of the dynamic ac susceptibility show maximum at T_c, that shifts toward lower temperatures with decreasing ac frequency; an additional maximum is observed at 7 K. The analysis of the frequency dependency of the ac susceptibility reveals the presence of three relaxation processes. The temperature dependencies of their relaxation times are determined using Cole-Cole analysis. The slowest relaxation process is characterized by the scaling law with the dynamical critical exponent $z\nu$=8, and the characteristic relaxation time about 6×10^{-4} s. The magnetic properties of the compound are explained using random-field Ising model, with randomness brought on by vacancies in vanadium sites. The relaxation processes observed are related to the fluctuations of the magnetic moment of various size clusters. This work was supported by NSF DMR 0313963.

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