We demonstrate numerically that for the strongly anisotropic homometallic $S = 2$ canted single chain magnet [1] described by the quantum antiferromagnetic Heisenberg [2] model the correlation energy and exchange coupling constant can be directly estimated from the in-field-magnetization profile found along the properly selected crystallographic direction. In the parameter space defined by the spherical angles ($\phi, \theta$) determining the axes orientation, four regions are identified with different sequences of the characteristic field-dependent magnetization profiles representing the antiferromagnetic, metamagnetic and weak ferromagnetic type behavior. These sequences provide a criterion for the applicability of the anisotropic quantum Heisenberg model to a given experimental system. Our analysis shows that the correlation energy decreases linearly with field and vanishes for a given value $H_c$ which defines a special coordinates in the metamagnetic profile relevant for the zero-field correlation energy and magnetic coupling. For the single chain magnet formed by the strongly anisotropic manganese(III) acetate meso-tetraphenylporphyrin complexes coupled to the phenylphosphinate ligands [3], the experimental metamagnetic-type magnetization curve in the $c$ direction yields an accurate estimate of the values of correlation energy $\Delta \xi/k_B = 7.93$ K and exchange coupling $J/k_B = 1.20$ K.

Ort: ITP, Raum 210

Interessenten sind herzlich eingeladen!

gez. Prof. Janke