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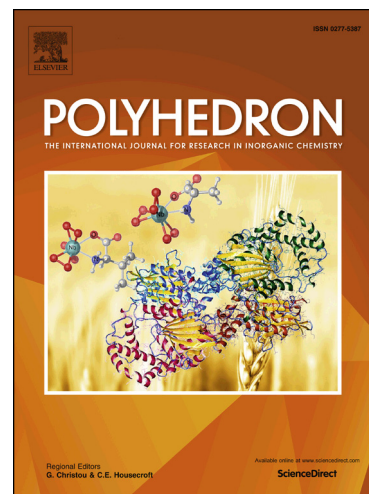
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Chemical trend on the lanthanide-radical exchange coupling

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ABSTRACT

From the high-frequency electron paramagnetic resonance spectra on $[\text{Ln}(\text{hfac})_3(\text{TMIO})_2]$ ($\text{Ln} = \text{Tb}, \text{Dy}$; $\text{TMIO} = 1,1,3,3\text{-tetramethylisindolin-2-oxyl}$; $\text{hfac} = 1,1,1,5,5,5\text{-hexafluoropentane-2,4-dionate}$) the level-crossing fields of the radical signal of the Tb and Dy complexes were determined to be 21.9(3) and 20(2) T, respectively. The observation of a single signal is consistent with the two-fold molecular symmetry. The coupling constants were evaluated, giving $J_{\text{Tb-rad}}/k_{\text{B}} = -4.47(4)$ K and $J_{\text{Dy-rad}}/k_{\text{B}} = -3.2(4)$ K. Since the exchange coupling constant in $[\text{Gd}(\text{hfac})_3(\text{TMIO})_2]$ has already been determined to be $J_{\text{Gd-rad}}/k_{\text{B}} = -12.5(4)$ K from the magnetic susceptibility measurements, the lanthanide-dependence on $|J_{\text{Ln-rad}}|$ was concluded as $|J_{\text{Gd-rad}}| > |J_{\text{Tb-rad}}| > |J_{\text{Dy-rad}}|$ in this series.

Keywords: lanthanide; lanthanoid, rare earth metal; exchange interaction; electron paramagnetic resonance; single-molecule magnet

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