

# Tricyanomethanides of Lanthanoids: $\text{Eu}[\text{C}(\text{CN})_3]_3 \cdot 4\text{H}_2\text{O}$ and $\text{Yb}[\text{C}(\text{CN})_3]_3 \cdot 2\text{H}_2\text{O}$

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Rare earth tricyanomethanides (tcm),  $\text{Ln}(\text{tcm})_3 \cdot x\text{H}_2\text{O}$ , have been prepared by metathesis reactions in aqueous solution of the corresponding lanthanide trichlorides and  $\text{Ag}(\text{tcm})$ . The structures of the compounds have been solved and refined with the aid of single-crystal and powder X-ray diffraction methods, respectively.

In general,  $\text{tcm}^-$  anions form bonds with preservation of their planarity and act as bridging ligands hence to form co-ordination polymers. Because of the high degree of delocalization of the ionic charge, the three cyano N atoms are equally capable establishing coordinate bonds. This enables tcm ions not only to act as monodentate ligands, but preferably as bi- or tridentate ligands. A large number of tcm compounds is described, including alkaline<sup>[1,2]</sup>, alkaline-earth<sup>[3]</sup>, main group<sup>[4,5]</sup>, and transition metal<sup>[6]</sup> species. In contrast, very little is known about lanthanoid tricyanomethanides<sup>[7]</sup>.

$\text{Eu}(\text{tcm})_3 \cdot 4\text{H}_2\text{O}$  (Fig. 1) crystallizes in the monoclinic system in the space group  $P 2_1/c$ . The Eu ion coordinates to five nitrogen atoms of the tcm ligands and four water molecules in a distorted tricapped trigonal prismatic configuration. Four tcm ligands act as  $\mu^2$  bridging units forming infinite chains of doubly connected Eu ions which are connected to neighbored once by hydrogen bonds through the nitrogen atoms of the remaining tcm units.  $\text{Yb}(\text{tcm})_3 \cdot 2\text{H}_2\text{O}$  (Fig. 2) crystallizes orthorhombic,  $P 2_12_12_1$ . The Yb ion is eight-fold coordinated by six tcm anions and two water molecules in form of a distorted quadratic antiprism. In contrast to the Eu compound, the Yb ion is surrounded by tcm units in three different bridging modes, revealing a three dimensional network with additional hydrogen bonds.

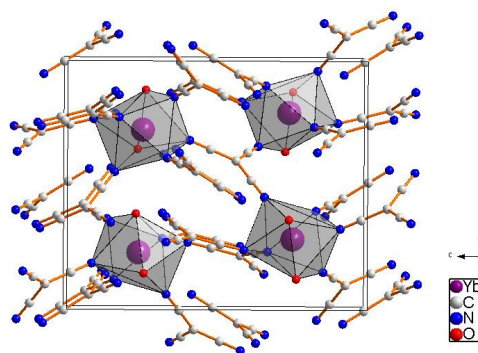
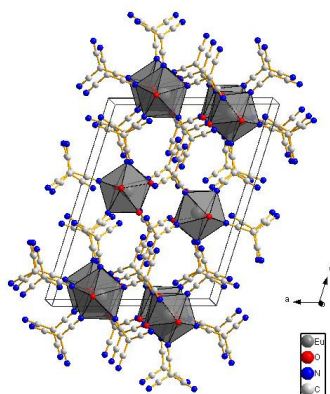


Fig.1: Crystal structure of  $\text{Eu}(\text{tcm})_3 \cdot 4\text{H}_2\text{O}$       Fig.2: Crystal structure of  $\text{Yb}(\text{tcm})_3 \cdot 2\text{H}_2\text{O}$

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