

# Hydrogen-Bonded Networks Featuring Yttrium(III) Complexes of N,N'-Dimethylurea (DMU): Preparation and Characterization of $[Y(DMU)_6][YCl_6]$ and $[Y(NO_3)_3(DMU)_3]$

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Z. Naturforsch. **60b**, 363–372 (2005); received January 13, 2005

*In dedication to Professor Herman O. Desseyn for his 65<sup>th</sup> birthday and for his important contributions to Coordination Chemistry and Vibrational Spectroscopy*

In order to examine the possibility of using yttrium(III) in the crystal engineering of hydrogen-bonded coordination complexes and to compare the molecular and supramolecular  $Y^{III}/Cl^-$  or  $NO_3^-/DMU$  chemistry with the already well-developed  $Ln^{III}/Cl^-$  or  $NO_3^-/DMU$  chemistry ( $Ln^{III}$  = lanthanide, DMU = N,N'-dimethylurea), compounds  $[Y(DMU)_6][YCl_6]$  (**1**) and  $[Y(NO_3)_3(DMU)_3]$  (**2**) have been prepared. The structures of both compounds have been determined by single-crystal X-ray diffraction. The structure of **1** consists of octahedral  $[Y(DMU)_6]^{3+}$  and  $[YCl_6]^{3-}$  ions. The  $Y^{III}$  ion in **2** is nine-coordinate and ligation is provided by three O-bonded DMU ligands and three bidentate chelating nitrato groups; the coordination polyhedron about the metal can be viewed as a distorted, monocapped square antiprism. The  $[Y(DMU)_6]^{3+}$  cations and  $[YCl_6]^{3-}$  anions self-assemble to form a hydrogen-bonded 3D architecture in **1**. Most of the hydrogen-bonding functionalities on the components of **2** create also a 3D network. Two motifs of interionic/intramolecular hydrogen-bonds have been observed: N-H...Cl in **1** and N-H...O( $NO_3^-$ ) in **2**. The IR data are discussed in terms of the nature of bonding and the structures of the two complexes.

**Key words:** Crystal Structures, Hydrogen-Bonded Coordination Complexes, Vibrational Spectroscopy, Yttrium(III)/N,N'-Dimethylurea Complexes, Yttrium(III) Nitrate Complexes