

Editorial

Coordination Polymers and Metal-Organic Frameworks: Structures and Applications—A Themed Issue in Honor of Professor Christoph Janiak on the Occasion of His 60th Birthday

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This themed issue of *Chemistry* is in honor of Professor Christoph Janiak on the occasion of his 60th birthday, and celebrates his innovative contributions to the fields of supramolecular chemistry, coordination polymers, networks and metal-organic frameworks, inorganic/organic hybrid materials and inorganic materials from ionic liquids.

Professor Janiak currently holds a chair in Bioinorganic Chemistry and Catalysis at the Heinrich Heine University of Düsseldorf and his research interests span metal-organic frameworks (MOFs), coordination polymers, chirality, supramolecular interactions and metal nanoparticles in ionic liquids. Two of his seminal reviews have influenced many of us working in the fields of heterocyclic chemistry and coordination networks: "A critical account on π - π stacking in metal complexes with aromatic nitrogen-containing ligands" (*Dalton Trans.* 2000, 3885) and "Engineering coordination polymers towards applications" (*Dalton Trans.* 2003, 2781), which have been cited close to 6000 times.

The issue begins with a preface written by Spyros Perlepes, which provides a personalized account of the achievements of Christoph Janiak. This sets the scene for many of the topics covered in the eleven contributions described in this editorial.

Baca and Kögerler have contributed a review dealing with cluster-based coordination polymers in which the clusters act as nodes in the assemblies. The focus is on recent developments in architectures containing Mn/Fe-oxo pivalate and isobutyrate building blocks, and on the synthetic strategies and the magnetic behavior of these coordination polymers [1].

Carboxylate linkers are popular choices in the assembly of coordination polymers and networks, and therefore it is not surprising that these donors feature in several of the papers in this themed issue. The metal-organic framework UiO-66 is formed from $ZrCl_4$ and terephthalic acid, and is a highly stable assembly. Yang, Schröder and coworkers have demonstrated the ability of a defective form of UiO-66 to take up I_2 , and this investigation is relevant to the uptake and storage of radioactive I_2 [2]. Additionally related to adsorption of toxic small molecules (in this case CS_2), Li and coworkers have described the conjugate bases of 4',4''',4''''',4''''''-(ethene-1,1,2,2-tetra-yl)tetrakis([1,1'-biphenyl]-4-carboxylic acid), H_4tcbpe , and a tetrafluoro-derivative, $H_4tcbpe-f$, which act as tetratopic ligands to assemble $[Zr_6(\mu_3-O)_4(OH)_8(tcbpe)_2(H_2O)_4]$ and $[Zr_6(\mu_3-O)_4(OH)_8(tcbpe-f)_2(H_2O)_4]$; these assemblies are strongly luminescent and have been applied as fluorescent sensors for the detection of CS_2 [3]. Chhetri, Chen and coworkers have detailed a series of coordination polymers constructed from copper(II) or cadmium(II) combined with semi-rigid N,N' -bis(3-pyridyl)terephthalamide and dicarboxylic acids; the assemblies encompass 1D, 2D and 3D architectures [4]. The chelidonate ligand has the potential to offer several different metal-binding modes. In their paper, Carballo et al. have combined chelidonic acid and either 4,4'-bipyridine or 1,2-bis(4-pyridyl)ethane with zinc(II) and copper(II) to give a

Citation: Housecroft, C.E. Coordination Polymers and Metal-Organic Frameworks: Structures and Applications—A Themed Issue in Honor of Professor Christoph Janiak on the Occasion of His 60th Birthday. *2021*, *3*, 831–833. <https://doi.org/10.3390/chemistry3030060>

Received: 14 July 2021

Accepted: 27 July 2021

Published: 28 July 2021

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series of coordination polymers in which the chelidonate dianion acts either as a non-coordinating counterion, or as a bridging ligand [5].

Linkers incorporating pyridine donors are also popular among coordination polymer chemists. The work by Carballo et al. [5] introduced these donors, and this is complemented by a report from Andruh, Avarvari and coworkers concerning the coordination behavior of three bis(pyridine) ligands containing benzothiadiazole spacers. Both discrete and polymeric assemblies are described with zinc(II) and silver(I) [6]. Two contributions focus on terpyridines. Harrowfield and coworkers provide a detailed analysis of the weak interactions in the single crystal structures of 33 metal(II) complexes incorporating twelve 4'-functionalized 2,2':6',2''-terpyridine (tpy) ligands. The structural and packing details that are revealed in this investigation should be valuable in the future design of functional materials based on tpy [7]. While 2,2':6',2''-terpyridine is the ubiquitous isomer of terpyridine, 3,2':6',3''-terpyridine has been far less studied. We have contributed to this issue of *Chemistry* with an investigation of the effects of the conformational flexibility of 3,2':6',3''-tpy (functionalized in the 4'-position with a biphenyl domain) on the structures and crystal packing of 1D coordination polymers bearing $\text{Cu}_2(\mu\text{-OAc})_4$ paddle-wheel units [8].

The final three contributions are focused either on the magnetic or electrochemical properties of arrays with different nuclearities or on organic donor-acceptor Stenhouse adducts, respectively. Cimpoesu, Ferbinteanu and coworkers describe a series of pyrazolato-bridged, multinuclear copper(II) coordination compounds; the magnetic properties of these Cu_3 , Cu_6 and Cu_7 -containing species are dominated by the strong antiferromagnetism across the pyrazolate bridges [9]. Neville and coworkers have investigated the use of the *N*-(pyridin-4-yl)benzamide ligand in {Fe(II)Pd(II)} and {Fe(II)Pt(II)}-containing 2D Hofmann-type frameworks to facilitate spin crossover cooperativity through hydrogen bonding involving the amide moiety [10]. A departure from the main theme of the issue comes with an investigation of donor-acceptor Stenhouse adducts. These represent a class of photoswitches that undergo light-initiated triene cyclization. However, D'Alessandro and coworkers have demonstrated that electrochemical oxidation is an effective alternative stimulus [11].

I would like to take this opportunity to thank all the teams of researchers who have contributed to this issue, which is dedicated to Christoph Janiak. Together, we express our sincere good wishes on the occasion of Christoph's 60th birthday.

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