

Editorial

AppliedChem: Modern Challenges in the Chemical Sciences

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While *pure* chemistry aims to enhance knowledge within the chemical sciences, *applied* chemistry exploits the principles and theories of chemistry to answer specific questions or solve real-world challenges. Researchers in applied chemistry require a breadth of knowledge that allows them to make use of fundamental chemistry principles in a diversity of related (or potentially unrelated) areas and also to engage in collaborations in physical, life, and social sciences along with industry and beyond. The economic and societal impact gained from research in applied chemistry can be significant, and this new journal, *AppliedChem* (ISSN 2673-9623) [1], aims to be a portal for disseminating new and exciting research in this area.

My own research lends itself well to the applied chemistry theme and exemplifies the area. Having trained in fundamental organometallic, coordination, supramolecular, and catalytic chemistries, my group is now applying their chemistry knowledge to the topics of metal separations and recycling. This area is a significant challenge for chemists that impacts on general themes such as chemical sustainability, critical metal resources and materials balances, and environmental remediation [2–4]. In particular, we have studied the solvent extraction of gold by simple primary amides from mixed-metal acidic solutions derived from electronic waste [5,6]. Inherent to these studies is the production of quantitative analytical data, understanding interfacial chemical transport mechanisms, and the characterisation of metal complexes in aqueous and organic solutions using a range of techniques such as NMR spectroscopy, mass spectrometry, and computational molecular dynamics. By assimilating data from this range of techniques, we have found that gold compounds are extracted selectively as dynamically exchanging supramolecular assemblies, and this insight has informed us of the next chemical steps to take to improve selectivity [7].

Others in this area have studied how different acids and oxidants can leach metals from electronic waste in a sustainable manner, in this case through the application and analysis of solid–liquid interfacial chemistry [8,9]. Furthermore, the use of selective adsorption and precipitation techniques is providing new routes to metal separation and has, for example, been applied to gold and rare-earth separations [10–13]. These studies also exploit fundamental chemical understanding, in particular those associated with supramolecular assembly processes and the analysis of the subtle changes in coordination chemistry across the rare-earth series. The discovery that α -cyclodextrin precipitates gold from acidic solutions has led to its commercialisation as a sustainable alternative to cyanidation for gold extraction [14].

Important to all of these research advances is the recognition that chemistry solutions on their own are not always enough to solve a particular challenge. In the metal recycling arena, thought must also be given to the metal material balances and supply chains, the business cases for ultimately providing circularity in resource supply and use, engineered process solutions, and environmental issues surrounding metal extraction, waste, and its processing [15–17]. It is clear that multifaceted collaborations are required, which makes this challenge both demanding and exciting.

Strong overlaps also abound between the chemical sciences and, for example, biology (drug development and delivery, food science), physics (magnetic materials, solar cells,



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supercapacitors), geosciences (carbon capture, storage, and utilisation), and engineering (process design and sustainable energy generation and use), which result in environments into which the applied chemist can provide new insight and deliver innovative solutions. It is evident that this breadth of application requires a forward-looking, high-quality, and informative journal that represents all that is new and exciting in the applied chemistry field. As such, the new journal *AppliedChem* covers all applied themes and challenges associated with modern chemistry. It is international, peer-reviewed, and open access, and aims to encourage scientists to publish their new results in as much detail as possible with no restriction on manuscript length. It has a very wide scope, from the firm foundation of the organic, inorganic, and physical chemistry pillars to encompassing cross- and interdisciplinary topics. I hope that this new journal will provide a suitable springboard for reporting research innovation and advances that exploit pure chemical knowledge in a wide range of modern technologies and that it will generate a broad readership that acknowledges the interest, excitement, and importance of applied chemistry research.

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Short Biography of Author

Jason B. Love is Professor of Molecular Inorganic Chemistry at the University of Edinburgh. He was awarded his BSc in Applied Chemistry from Salford University (1989) and his PhD on “Heterobimetallic rhenium polyhydride complexes” from the same institution (1993). He undertook post-doctoral fellowships at the Universities of Sussex (polymerization catalysis), British Columbia (dinitrogen chemistry), and Nottingham (anion binding) before being awarded a Royal Society University Research Fellowship and Lectureship at the University of Sussex (1999). He moved from Sussex to Nottingham and then to Edinburgh as a Senior Lecturer (2007), was promoted to Reader (2010), and Professor (2015). His research includes sustainable transition metal and f-element chemistry, supramolecular recognition, catalysis and metal recycling and recovery. He is a Fellow of the Royal Society of Chemistry and Chartered Chemist, a member of the American Chemical Society, and was awarded the 2020 Anders Gustav Ekeberg Tantalum Prize.