Biomimetics in Bioengineering 2018 – Professor Frank Caruso

Brief Biography:

Frank Caruso is a professor and a NHMRC Senior Principal Research Fellow at The University of Melbourne. He is also Deputy Director of the ARC Centre of Excellence on "Convergent Bio-Nano Science and Technology". He received his PhD degree in 1994 from The University of Melbourne, and from 1994-1997 was at the CSIRO Division of Chemicals and Polymers in Melbourne. He was an Alexander von Humboldt Research Fellow and group leader at the Max Planck Institute of Colloids and Interfaces (Berlin, Germany) from 1997–2002. From 2003-2012 he was an ARC Federation Fellow at The University of Melbourne. He has published over 430 peer-reviewed papers. He is one of Thomson Reuters' Highly Cited Researchers (top 20 in materials science) and was on Thomson Reuters' 2014 list of World's Most Influential Scientific Minds. He is an Executive Editor of *Chemistry of Materials* and on the Editorial Advisory Board of ten other scientific journals. He was elected a Fellow of the Australian Academy of Science in 2009.

Keynote Title: Supramolecular Materials from Metal-Phenolic Networks

Abstract:

The development of rapid and versatile coating strategies for interface and particle engineering is of immense scientific interest. Recently, we reported the rapid formation of thin films comprised of metal–phenolic networks (MPNs) on various substrates by simply mixing natural polyphenols and metal ions. This coating technique is substrate independent (covering organic, inorganic and biological substrates) and has been used for the assembly of capsules by coating particles and then removing the coated templates. It will be shown that a range of polyphenols and a library of metal ions are suitable in forming MPNs for film and capsule engineering. The MPN films and capsules are stable at physiological pH but degrade at acidic pH, making them of interest for intracellular release of therapeutics. By altering the metal ions, different functions can be incorporated in the MPN materials, ranging from fluorescence to MRI and catalytic capabilities. Furthermore, synthetic polymer-phenol conjugates have been used as building materials for control over the biofouling properties of the MPN materials. The ease and scalability of the assembly process, combined with pH responsiveness, negligible cytotoxicity and tunable properties, provides a new avenue for functional interface engineering, and makes these MPNs potential candidates for biomedical and environmental applications.