Quantitation of Supramolecular Host-Guest Complexation on Surface: from Nanostructure Differentiation to Electrochemical Sensing

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The macrocyclic cucurbit[n]uril (CB[n]) hosts have shown dramatically increased research interests for the past two decades; their excellent guest recognition capability leads to application potentials as synthetic immobilization and bioconjugation motifs. For example, the inclusion complexes formed between CB[7] and various ferrocene (Fc) derivatives have extremely high binding affinities (10^9 to 10^{12} M^{-1}), which have been employed as an alternative of natural binding pairs (e.g., antigen-antibody, biotin-avidin) for fabricating versatile biosensing interfaces. Based on both conventional cyclic voltammetry and advanced structural characterization, the complexation of Fc@CB[7] has been investigated on mixed ferrocenylundecanethiolate / octanethiolate self-assembled monolayers (SAMs) on gold. The results showed that the inclusion binding behavior of this host-guest pair, while significantly affected by the surface, still has satisfactory stability for practical applications. The broad potential of this new interfacial Fc@CB[7] host-guest binding motif is manifested as nanoscale probes for the distribution of Fc terminal groups on SAMs, as an environmental regulator of long-range electron transfer process, and as a quantitative, competitive assay for pharmaceutical drugs. It is expected that this new interfacial host-guest binding system can be further explored for fabricating well-controlled, ratiometric electrochemical biosensors.

Brief biography. Hua-Zhong "Hogan" Yu grew up in countryside China and completed his undergraduate and graduate studies at Shandong University (Ji'nan, 1991) and Peking University (Beijing, 1997), respectively. He then went to California Institute of Technology worked with Ahmed Zewail (1999 Nobel Laureate in Chemistry) and Fred Anson as a postdoctoral fellow. After short stays at National Research Council (Ottawa) and Acadia University (Wolfville), Dr. Yu joined Simon Fraser University in 2001. He became an associate faculty of the Department of Molecular Biology and Biochemistry in 2007; and was granted early promotion to full professor in 2009. His research spans a broad range of topics in physical, analytical, and materials chemistry, with ~ 200 papers in refereed journals (more than half as ACS and Wiley-VCH publications), 20 National / International patents, and over 200 invited lectures worldwide. Dr. Yu has won several major awards, including the 2004 CSC Fred Beamish Award, the W. Lash Miller Award of the Electrochemical Society (ECS) Canadian Section in 2011, the Tajima Prize of the International Society of Electrochemistry (ISE) in 2012, the CSC W.A.E. McBryde Medal in 2015, and recently Fellow of the Royal Society of Chemistry (2021). Dr. Yu is currently an associate editor for *Analyst*, the RSC flagship journal for analytical and bioanalytical sciences.