特邀学术报告

Single-Atom Metal Catalysts for Efficient Fuel Processing and Green Chemicals Production

嘉宾： Prof. Maria Flytzani-Stephanopoulos

时间：2016年10月18日 （星期二） 9:00-11:00

地点：过程大厦223会议室

嘉宾简介：

Dr. Flytzani-Stephanopoulos is a Distinguished Professor and the Robert and Marcy Haber Endowed Professor in Energy Sustainability in the School of Engineering at Tufts University. She joined the Chemical Engineering Faculty of Tufts University as the Raytheon Professor of Pollution Prevention in January 1994. Her previous work experience was with MIT's Department of Chemical Engineering, and the Jet Propulsion Laboratory in Pasadena, CA. At Tufts, she directs the Nano Catalysis and Energy Laboratory, which investigates new catalyst materials for the production of hydrogen and 'green' chemicals. Pioneering work from her lab has demonstrated the use of single atom catalysts for reactions of interest to fuel processing, which entails efficient and sustainable use of precious metals in clean energy production, and in the commodity and value-added chemicals production with improved yields and reduced carbon footprint. Since 2002, she has served as Editor of *Applied Catalysis B: Environmental*, and is an Associate Editor of *Science Advances*. She holds ten patents and has written more than 160 technical papers. She is the recipient of a number of awards, including the Tufts Distinguished Scholar award, the Henry J. Albert award of the International Precious Metals Institute, the Giuseppe Parravano Memorial award of the Michigan Catalysis Society, the Graduate Teaching and Mentoring Award of the Tufts School of Engineering, and the Carol Tyler award of the IPMI. She is a member of the National Academy of Engineering and a Fellow of the AAAS and the AIChE.

报告摘要：

Catalyst design and development aims at more efficient and sustainable chemical processes. To this end, identification of the active catalytic site and design of catalysts with 100% atom efficiency has been a long-standing goal in heterogeneous catalysis. A novel approach to reaching this goal through single-atom metal catalysts has emerged in the recent literature. Atomically dispersed supported metal catalysts offer new prospects for low-cost fuel processing and green chemicals production (*Annu. Rev. Chem. Biomol. Eng.* 2012, 3). In this presentation, metal catalysts prepared as single atoms/cations on various supports will be reviewed drawing examples from a variety of reactions, including the low-temperature water-gas shift reactions (*Science* 2003, 301, 935; *Science* 2014, 346, 1498; *J. Am. Chem. Soc.* 2015, 137, 3470), methanol steam reforming, and methanol and ethanol dehydrogenation reactions; and several selective hydrogenation reactions (*Science* 2012, 335, 1209; *Nat. Commun.* 2015, 6, 8550). We will demonstrate how reaction mechanisms involving single metal atoms/cations, transcend support structure and composition as long as the metal atom-centered, oxygen bonded active site, M-O_x-, is allowed to form stably. A unique “signature” of the metal (Au, Pt, Pd, etc.) at the atomic state is preserved, distinct however from the corresponding extended metal catalyst. Novel synthesis methods will be discussed as will be the stability of atomically dispersed catalysts in various reaction environments.