Biosketch – Li JIA

Professor Jia holds a dual appointment in School of Polymer Science and Polymer Engineering and Department of Chemistry at The University of Akron. He received his bachelor's degree in chemistry from Lanzhou University, China. He conducted his Ph.D. research under the supervision of Professor Tobin Marks at Northwestern University and his postdoctoral research under the supervision of Professor Richard Andersen at University of California – Berkeley. His current research interests include transition metal-catalyzed polymerization, self-assembly in polymeric materials, and rubber chemistry and technology. His visit to Japan is supported by a JSPS fellowship.

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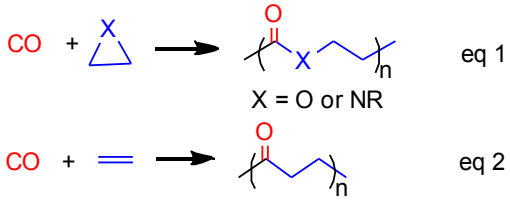
Metal-catalyzed carbonylative polymerizations - A quest for sustainable commodity plastics

Millions of tons of plastics are produced and disposed of globally each year. The plastic waste in the environment has created a plastic crisis. To make plastics more degradable in the environment and more recyclable by chemical means, functional groups must be present in the polymer backbone. Transition metal-catalyzed carbonylative polymerization (COP) is a powerful method for synthesis of a wide range of polymers with carbonyl groups in the backbone (for example, eqs 1 and 2).



This presentation encompasses the studies of the Jia group in this area in the last two decades. Rational discovery of acyl-$Co(CO)_4$ as the catalyst for the COP of aziridines and epoxides (eq 1) will be first discussed.[i] A detour to the COP of ethylene (eq 2) catalyzed by zwitterionic Ni(II) complexes will follow.[ii] With the evolution of the zwitterionic Ni (II) catalysts, the COPs of the two types of monomers eventually converge. The zwitterionic Ni(II) complexes isoelectronic to acyl-$Co(CO)_4$ act as dual-site catalysts for COP of ethylene together with cyclic ethers. Depending on the distribution of the monomers, the products range from elastomers to plastics.

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[i] (a) Jia, L.; Ding, E.; and Anderson, W. R. *Chem. Commun.* **2001**, 1436-1437. (b) Liu, G.; Jia, L. *J. Am. Chem. Soc.* **2004**, *126*, 14716-14717.

[ii] (a) Dai, Y.; He, S.; Peng, B.; Crandall, L. A.; Schrage, B. R.; Ziegler, C. J.; Jia, L. "Zwitterionic Design Principle of Ni(II) Catalysts for Carbonylative Polymerization of Cyclic Ethers", *Angew. Chem., Int. Ed.* **2018**, *130*, 14111-14115. (b) Jia, X.; Zhang, M. Pan, F.; Babahan, I.; Ding, K.; Jia, L.; Crandall, L. A.; Ziegler, C. J. *Organometallics* **2015**, *34*, 4798-4801.