Design and Applications of Selective Olefin Metathesis Catalysts

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Olefin Metathesis has become a tool for the synthesis of complex organic molecules and materials. The key to the development of these applications has been the discovery and study of organometallic complexes that will efficiently catalyze the reaction in the presence of standard funcitional groups. The next advances resulted from the development of more selective catalysts and complexes that show high turn over numbers in important transformations. Over the past several years two families of complexes have been developed that produce high Z selectivity in the cross metathesis of terminal olefins. Some of these catalysts now produce Z olefins in >95 Z at >95% conversions with high turn over numbers. The next challenge is to produce a catalyst that produces olefins with high E selectivity. A number of strategies are being developed for the construction of such catalysts.

In addition to their use in organic synthesis, many of the catalytic complexes also serve as initiators for living polymerization. A number of brush-block copolymers that assemble into well ordered structures can be prepared using these initiators.

Although there are now a number of commercial processes based on olefin metathesis, others will only become possible with even more selective and efficient catalysts.