Efficient Alkane Metathesis by Tandem Catalysis Phase I: Olefin Metathesis

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Tremendous efforts have been devoted to developing more efficient and robust catalysts that could bridge the gap between highly active homogeneous catalysts (TOF of $10^3$-$10^4$/h) and easily separable heterogeneous catalysts (TOF of $10^1$-$10^2$/h). To the best of our knowledge, no olefin metathesis catalyst has been reported to simultaneously possess high activity, selectivity, stability, and ease of regeneration.

We discovered that a simple pretreatment of silica supported molybdenum oxide and tungsten oxide in an olefin-containing atmosphere at elevated temperatures led to two to three orders of magnitude higher activity for propylene metathesis. The catalytic performances of these catalysts are comparable with those of well-defined organometallic olefin metathesis catalysts and are easily regenerated by inert gas purging at elevated temperatures.

Our work provides a surprisingly convenient way to bridge low-cost and easily regenerated heterogeneous catalysts with highly active and selective homogeneous catalysts for olefin metatheses.