Efficient Synthesis of the Interlocked Compounds by Catalytic Reactions

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Interlocked compounds such as rotaxanes and catenanes are attractive molecules, and application of these molecules to the drug delivery system or nanomaterials is expected. The template method has been used as a standard method for the synthesis of these interlocked compounds. This method, however, could only be applied to the synthesis of compounds with a limited structural motif, and the development of a more general method for the synthesis of these compounds is highly desirable.

We recently developed a new and efficient method for the synthesis of interlocked compounds. Thus, we prepared macrocyclic transition metal complexes (phenanthroline-Cu complexes) and carry out coupling reactions which would be catalyzed by these complexes. The Cu-catalyzed C-S bond forming reactions and oxidative homocoupling reactions of alkynes were examined. When a substrate with a large blocking group (tris(biphenyl)methyl group) was used, the formation of rotaxanes was observed. In this symposium, we will discuss various examples for the synthesis of interlocked compounds by this methodology.