OP-1

MULTICOMPONENT CATALYTIC MACHINERY: HOW THE MACHINE SPEED IMPACTS CATALYTIC ACTIVITY

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While nature has built and optimized rotating catalysts (e.g. ATP synthase) over millions of years with the purpose to improve catalytic conversion for instance by eliminating product inhibition, abiotic examples using analogous nanomechanical action in catalysis have been lacking. Recently, we have developed examples of multicomponent machinery that operate by two distinct novel mechanisms. The first machinery operates by dynamic allosteric effect that leads to an increasing liberation of catalyst into solution the higher the rate of machine motion.[1] In the second example, product inhibition is increasingly reduced at augmented machine speed.[2] The complete mechanism of action in both catalytic machinery has been clarified by a variety of physical organic methods, including VT-NMR to determine the machine speed, evaluation of the catalytic rate at zero conversion (v_0), binding constants, speciation analysis and product liberation studies.

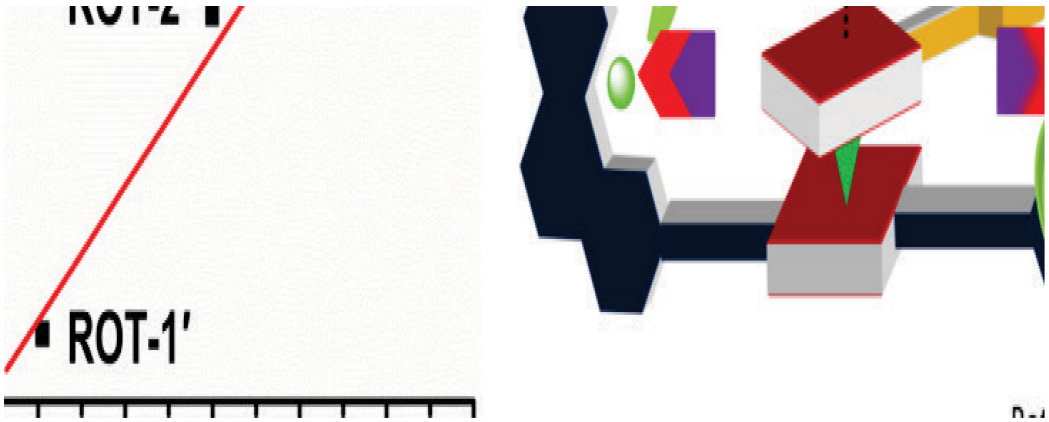

Figure 1. Cartoon representation of the multicomponent catalytic machinery that increases conversion due to reduction of product inhibition at higher machine speed.

REFERENCES

[1] I. Paul, A. Goswami, N. Mittal, M. Schmittel, *Angew. Chem. Int. Ed.* **2018**, *57*, 354–358.
[2] P. Biswas, S. Saha, T. Paululat, M. Schmittel, *J. Am. Chem. Soc*. **2018**, *140*, 9038–9041.