Catalysis as a tool to control soft matter behavior

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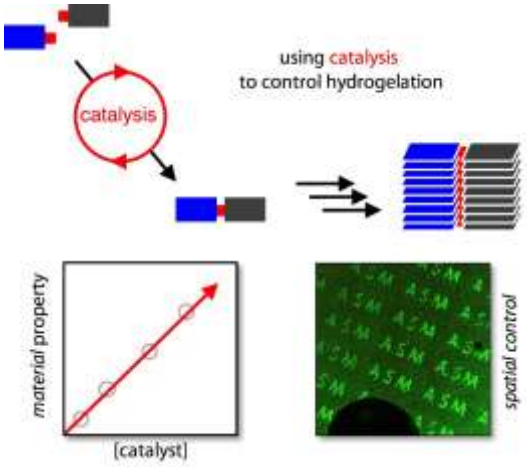
Biological tissue and the living cell arguably constitute the epitome of soft matter. Especially in terms of dynamic functions and processes such as transport, signalling/communication, self-healing, replication, transient assembly, and motion, biological systems go far beyond anything current artificial materials have to offer. In this presentation, I will show how we applied core concepts of biological self-assembly to the construction of dynamic, out-of-equilibrium soft molecular materials, in an attempt to bridge this gap.[1] We can now start to control dynamic properties such as lifetime, spatial/temporal distribution and signal-response by coupling the self-assembly process to chemical reactions, in particular using molecular catalysis.[2,3] In detail, I will show how the growth and properties of hydrogelator based networks based on hydrazone links can be controlled using either acid or nucleophilic catalysis, and how catalysis can be used to control the size of gel objects and to create responsive materials.[4,5]



[1] Boekhoven, J.; Hendriksen, W.E.; Koper, G.J.M.; Eelkema, R.; van Esch J.H.; *Science* **2015,** *349,* 1075-1079

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[3] Maity, C.; Hendriksen, W.E.; van Esch, J.H.; Eelkema, R.; *Angew. Chem. Int. Ed.* **2015,** *54,* 998-1001

[4] M. Lovrak, W. E. J. Hendriksen, C. Maity, S. Mytnyk, V. van Steijn, R. Eelkema, J. H. van Esch; *Nature Commun.*, **2017**, 8, 15317

[5] F. Trausel, C. Maity, J. M. Poolman, D. S. J. Kouwenberg, F. Versluis, J. H. van Esch, and R. Eelkema; *Nature Commun.* **2017**, 8, 879