

The power of one: what can be learned by studying individual molecules?

Johan Hofkens¹,

¹ *Katholieke Universiteit Leuven, Department of Chemistry, Lab. of Photochemistry and Spectroscopy, Celestijnenlaan 200 F, B-3001 Leuven, Belgium,
Johan.Hofkens@chem.kuleuven.be*

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Over the last 15 years, single molecule spectroscopy (SMS) has been established as a new tool in the ever expanding range of spectroscopic methods. SMS is especially useful to study inhomogeneous systems. Biological systems are by their nature highly heterogeneous and as such perfect targets for SMS. From this it is clear that, next to biological samples, material science (polymers, catalyst nano-particles) can benefit from single molecule measurements as materials are very often heterogeneous in their behavior. Furthermore, many theories that describe material properties are based on a microscopic picture that now can be evaluated experimentally by applying single molecule techniques. In this contribution, I will give an overview of how we study polymers (reptation, dynamics near glass transition, molecular motors), catalyst particles (heterogeneous catalysis and the problem of diffusion limitations) and biophysical processes (recent work on rafts, viruses and DNA mapping) with different single molecule techniques.