

A multidisciplinary approach to advancing drug development

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By drawing together expertise from across a range of fields, the Eindhoven University of Technology's Institute for Complex Molecular Systems is on the verge of a breakthrough that could have significant implications for the pharmaceutical industry.

Drug development often relies on organic catalysts - [tiny molecules](#) smaller than enzymes that can stimulate reactions - but one longstanding issue is that these molecules often cannot interact nor function in water. Addressing these two issues is important as it could help speed up [drug discovery](#) and provide a boost to Europe's important pharmaceutical sector.

As it stands, the limitations of these organic catalysts mean that lab work and clinical studies can be slow and inefficient. This is why the Institute for Complex Molecular Systems in Eindhoven has been working on trying to mimic the three-dimensional structure of enzymes and provide a synthetic alternative to organic catalysts.

A key feature of enzymes is that their outside is hydrophilic, meaning they can be used in water. Synthetic catalysts - with the properties of enzymes - could therefore help to speed up drug discovery by being more flexible and amenable to the needs of the pharmaceutical industry.

A significant number of marketed pharmaceuticals contain [active pharmaceutical ingredients](#) that are manufactured in part using catalysts as a key enabling technology. Demand for such catalysts is growing due to significant advances in technologies for [enzyme](#) discovery, supply, and improvement, as well as an increased focus on applications for chiral drugs and green chemistry.

Furthermore, the [pharmaceutical industry](#) is hugely important to the EU, not just in economic terms but also in terms of high-quality employment, investment in the science base and the benefits it brings to public health. In 2007, the manufacture of pharmaceutical preparations and basic pharmaceutical products was the principal activity of about 4 500 enterprises throughout the EU, while the number of people employed in the industry was estimated to be around 611 000.

Developing these synthetic catalysts however has not been easy, and has required all of the University's expertise. Indeed, the Institute for Complex Molecular Systems was specifically created to enable researchers from a number of different disciplines to work together. On this particular project, this has meant polymer chemists working with the polymer chains, organic chemists developing the catalysts and polymer physicists and mathematicians providing predictive models.

One of the benefits of working in this way has been the achievement of a more thorough, rounded understanding of synthetic catalysts, [drug development](#) and the behaviour of enzymes in general. In addition, researchers have had the opportunity to work with scientists they might not have had the chance to work with before, and to gain a better understanding of how other disciplines see the world.

Initial experiments on the synthetic catalysts are now running in order to see where improvements can be made. While it might be another few years before the final results of this research are published, the potential impact on drug development could be impressive.

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