Swapping molecular partners

An innocuous bacterium from South African river mud contains a very special substance: an anti-tumor substance called epothilone A, which can even inhibit the proliferation of certain tumors that are resistant to therapy. Chemistry Professor Alois Fürstner from the Max Planck Institute for Coal Research has made it possible to duplicate this and many other molecules from nature through the development of special catalysts. For his research work, he was awarded the 2006 Otto Bayer Prize.

Award-winner Professor Alois Fürstner developed novel catalysts for the synthesis of complex carbon compounds.

Nature holds many substances that are very useful to man: antibiotics, hormones, aromas and even anti-tumor molecules, such as epothilone A, which comes from the bacterium Sorangium cellulosum and was first described in the early 1990s. For a long time, however, chemical synthesis of these substances was both difficult and expensive, because its most important structural elements are medium-sized and large carbon rings that are very difficult to produce efficiently with conventional laboratory methods.

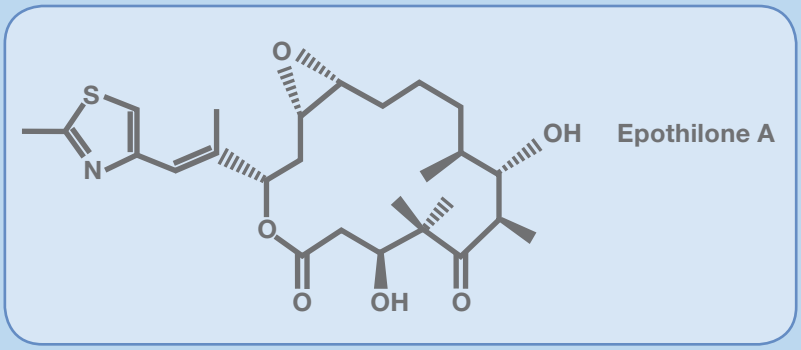
Alois Fürstner and his colleagues have succeeded in developing improved, highly specific and cost-effective catalysts for the synthesis of such large carbon rings. One thing that these catalysts make possible is the introduction of triple bonds instead of double bonds in what is known as ring closure metathesis – a chemical process in which the bond structure of unsaturated hydrocarbons is modified. The result is a change of position – metathesis – of chemical side-groups on the hydrocarbon structure. "This reaction, which at first glance is entirely unspectacular, is currently revolutionizing organic chemistry," explains Fürstner. It will make it comparatively easy to accurately duplicate in the laboratory natural substances that are structurally as complex as epothilone A, for example.

In recognition of his outstanding work, the 44-year old Austrian scientist, who was appointed Director at the Max-Planck-Institute for Coal Research in Mülheim an der Ruhr, Germany, in 1998, has now been awarded the 2006 Otto Bayer Prize worth EUR 50,000. "This award is an expression of our thanks for the fruitful cooperation between industry and fundamental research," said Bayer CEO Werner Wenning, paying tribute to the award-winner.

The Otto Bayer Prize is one of the most highly respected and coveted accolades for scientists in Germany. It has been awarded since 1984 in memory of Professor Otto Bayer, a former head of research and member of the Board of Management and Supervisory Board, who was not related to the company's founder.

www.mpi-muelheim.mpg.de
Projects tackled by Professor Fürstner and his "organometallic chemistry" group are presented on the website of the Max Planck Institute for Coal Research in Mülheim an der Ruhr, Germany.

Carbon's complexity



Natural substances like epothilone A can be duplicated with Professor Fürstner's catalysts. Every "corner" of the structural formula stands for a carbon atom.