

Dieter Freitag – a career in chemistry

Maître de plastics

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Portrait



"A research chemist must be able to do more than just create new materials," says Dr. Dieter Freitag – a man who knows what he's talking about. For him, perseverance and drive are equally indispensable. Plus, of course, that little bit of luck. In recognition of his achievements in plastics research, Dieter Freitag has now been inducted into the U.S. Plastics Academy Hall of Fame.



Plastics specialist: Dr. Dieter Freitag (left) invented a grade of Makrolon® that could be extremely precisely molded, thus paving the way for the CD. In recognition of his life's achievements, Dr. Freitag was inducted into the U.S. Plastics Academy Hall of Fame and received the Academy's award trophy (above right).

This article is supposed to be about a chemist, but the first formula we came across in this interview does not exactly fit the picture. Dr. Dieter Freitag shows us a Roman coin marked with the letters 'AUGGG'!... "Three Gs, do you know what that means?" It has something to do with the port of Krefeld on the river Rhine, where some private people were allowed to pursue their hobby of archaeology. And some of them found something, too – with that little bit of luck, of course.

"On Roman coins, AUG stands for the title Augustus, the name of the first emperor, which was then used for all subsequent emperors," says Freitag. But it often happened that several emperors ruled alongside each other at the same time – when times were good, in peace. The number of Gs tells us about the number of emperors in power. "This one here," explains amateur archaeologist Freitag, "stems from the year 312 AD, minted by none other than Constantine the Great. By marking it with three Gs, he was telling the people that, at that time, there were two other emperors apart from him."

Nowadays, however, metal coins are gradually becoming obsolete. "We've been using plastic credit cards for a long time now," smiles Freitag. And many of his own developments might prove to be at least as long-lasting as antique coins.

Freitag is a chemist. He worked at Bayer for nearly 34 years from 1967 to 2001 in Krefeld-Uerdingen and

Leverkusen. He has thick white hair, and sports a smart jacket and a red tie: "In my time, you could recognize a research chemist by his tie. I kept up the tradition."

Freitag is a plastics specialist. "Plastics are unique," he says, getting straight to the point. He is convinced that the only way to economically produce different shapes and forms that are both lightweight and highly resistant is to use plastics. "With these products, we can save an enormous amount of energy – by building lighter and cars for instance. Lightweight beverage packs are another example."

"Chemistry offers opportunities for fascinating innovations"

He ought to know because his name is closely connected with CDs and many other products from everyday life. Freitag is an inventor and co-inventor of 429 patents, was for many decades a member of high-caliber scientific committees and has received half a dozen international awards. In June 2006, he was inducted into the Plastics Hall of Fame in Chicago, which is one of the highest honors that exist in the field of plastics chemistry.

Freitag was born in 1939 in Offenburg, Germany. His parents had a grocery store and were against him going to high school in 1950. Fortunately, the class teacher changed his parents' minds. The young Freitag was soon fascinated by the chemistry lessons:



The road to inventions: as a chemistry student, Dr. Dieter Freitag conducted research into new forms of synthesis with what would now be regarded as very simple apparatus (left). In recognition of his research work at Bayer, he was awarded the Otto Bayer Medal in 1985, which was presented to him by the then Chairman of the Supervisory Board, Professor Herbert Grünewald (right).

"Chemistry provides an opportunity to produce substances that nobody has ever held in their hands before." He also had a voracious appetite for literature and played in the Offenbacher Kickers soccer youth team.

In 1959, he gained his school-leaving certificate and wanted to become a pharmacist. In those days, three years of study were enough for that qualification. "I wanted to gain financial security quickly but I would have been tremendously unhappy," he says today. And he was lucky. "You've got to study chemistry, anything else is out of the question," his girlfriend Katharina Schüssler told him. He married her, by the way, in 1966. He had to spend one year of his studies in Freiburg, but then registered at the University of Frankfurt, where he was awarded his doctorate in 1967 *summa cum laude*.

"Inventors must be able to fight for their inventions"

The same year, Dr. Hermann Schnell, the inventor of polycarbonates, fetched the young chemist to Bayer's Uerdingen plant. Polycarbonates had been on

the market since 1958 under the trade name Makrolon®. Freitag developed them further.

He succeeded, for example, in creating a plastic that was suitable for the production of large hollow articles. Until then, manufacturing articles larger than baby bottles had been unsuccessful because of the lack of stability of the parison, as the experts say when a plastic does not solidify fast enough after emerging from the die of an extruder. Freitag solved the problem by incorporating an unusual ring structure into the basic molecule – a heterocycle, an isatin bisresol – but promptly encountered widespread skepticism. "Impossible, it'll never work," they told him. Fortunately, he had been taught that "whenever you make a really important discovery, lots of people seem to know immediately that it definitely won't work." A good research chemist must not only come up with inventions, he must also be able to fight for them. In 1976, his substance, integrated into several Makrolon® grades, came on to the market. It is still used today to produce large water containers and those transpar-

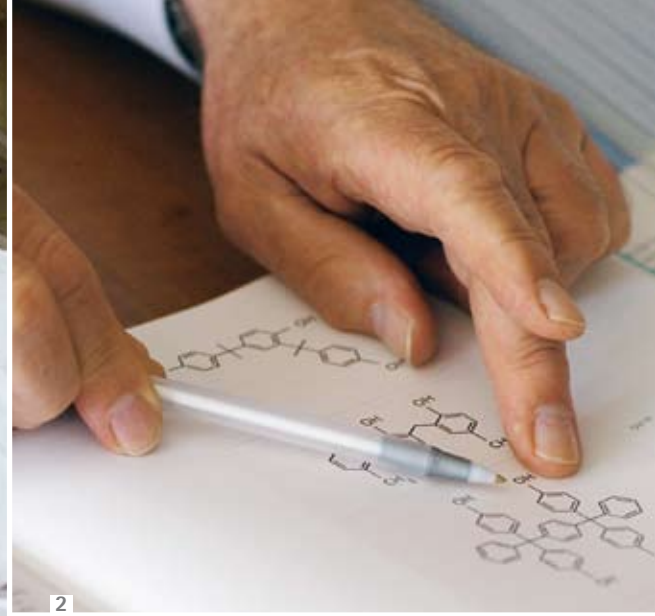
ent twin-wall sheets that cover greenhouses and are used for the roofs of stadia like the BayArena in Leverkusen.

In 1969 and 1970, his wife gave birth to sons, both of whom later became physicians. The elder one tragically died in 2002 in a traffic accident.

In 1978, Freitag played a leading role in the "sound carrier revolution". A research team from the Philips Group turned up at Bayer in Uerdingen one day. "They showed us a small metal disc and told us they'd digitized Beethoven's Third Symphony. They said they'd stored it on the disc in the form of four billion tiny indentations, and were now hunting for a substance suitable for mass-producing the new sound carrier."

New Makrolon® formulation brought the CD breakthrough

The hunt came just at the right time. A few years earlier, Freitag had developed a grade of Makrolon® that enabled molded parts to be manufactured with unprecedented precision. Initial trials had, however, been only moderately successful, and there were even signs that the product might be dropped.



Images of a life: Dr. Freitag (second left) and his former colleagues Dr. Karlheinz Hildebrand, Dr. Alexander Karbach and Dr. Alexander Meyer (left to right) assess a new form of Makrolon® granules (1). In recognition of his achievements in plastics research (2), Freitag was inducted into the U.S. Plastics Academy Hall of Fame (3: with Academy President Jay Gardiner and Vice President Vince Witherup). Freitag spends his spare time with his wife (4) and grandchildren (5).



Soon afterwards, however, this grade turned out to be the ideal plastic for duplicating the tiny indentations so accurately that the scanning laser beam was able to faultlessly recognize them. Production of the compact audio disc began in 1982 – with Makrolon® CD 2000. And in 1989, another new Freitag development came onto the market in the form of APEC® HT. Even today, this is the most heat-resistant grade of Makrolon® in existence – a particularly important aspect for car headlamps and medical equipment.

"Once you have the idea, the rest is teamwork"

In 1994, Freitag became head of Bayer's Central Materials Research division. At times he had 250 staff and a budget of

USD 50 million at his disposal. "You can perhaps invent something on your own, but the rest is the work of many good teams," he says.

When he retired in 2001, it was his wife who took the initiative again. "She explained to the chemistry professors at Bonn University that it would be impossible for me to sit at home twiddling my thumbs." Freitag was given some lecturing assignments, but didn't stop there. He is now a consultant for Triton Systems in Chelmsford, Boston, and jets across the pond every few weeks.

In his spare time, he teaches his three grandchildren soccer, or shows them salt crystals under the microscope: "It's never too early to show children just how fascinating science can be."



www.plastics.bayer.de

The Bayer MaterialScience website contains plenty of interesting information about Apec® HT and Makrolon® under "Find your product".

www.plasticsacademy.org

The Plastics Academy Hall of Fame honors personalities who have been of special service to the plastics industry.