


Sparkling whiteness

Partnership between a university and company makes the production of a new pigment for the paints industry possible

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Published in November 2005



It is no exaggeration to predict that within a few years a new pigment developed in a partnership between the Chemical Institute (IQ) of the State University of Campinas (Unicamp) and the company Bunge will be present in the formula of paints in various parts of the world. Biphor is the white pigment's name, produced starting from nanoparticles of aluminum phosphate that will go into competition with the current prime raw material, titanium dioxide. The advantages, according to professor Fernando Galembeck, the project's coordinator at the IQ and one of the discoverers of the product, are its lower price, between 10% and 15% lower than the dioxide, its durability and the greater easiness when applying the paint, as well as a production process that does not damage the environment and does not generate residues.

Announced to the world market in September, the aluminum phosphate pigment is destined for paints that are water based, the so-called latex paints, used for painting walls. Currently the Bunge group, a multinational of Dutch origin that has been more than 100 years in Brazil, is today working in the area of industrialized foods and fertilizer production, and is now operating a pigment production line with the annual capacity of 1,000 tons in the town

of Cajati, in the Ribeira River Valley region, in the state of São Paulo, some 230 kilometers from the capital. For 2007 the expectation, unconfirmed by the company, is that larger units should produce around 50,000 tons annually. This is still a small quantity when compared to the annual 2 million tons of titanium dioxide produced in the world, which represents a market value of US\$ 5 billion. The complete substitution demands large investments and makes up part of the distant future. "Perhaps it'll happen, but the dioxide has been in paint formulation since the start of the 20th century and consequently it possesses a solidified culture in its use." Although the company will not say how much it is investing in the new product, it is known that there are plans to sell Biphor abroad. An American marketing company was hired to publicize the

product in other countries, starting in Latin America.

The new pigment brings as an innovation the capacity to spread the light reflected from the paint. "It's composed of hollow nanostructured particles of aluminum phosphate, filled with air in the interior, capable of reflecting light in all directions", explains Galembeck. It's a situation similar to beer foam that is white, although the liquid is yellow, because the foam is full of air bubbles and they give back to the environment the light of all of the colors fall upon them. This is the property that paints must have in order to cover the surfaces over which they are applied: the capacity to throw light back to the environment. The same principle is true for aluminum phosphate, which was also tested in colored paints. In the liquid paint, the hollow particles are initially full of water, but when they get onto the wall the particles dry and remain full of air, gaining the capacity of reflecting back the light. The function of back reflection is well carried out by particles of titanium dioxide dispersed in the resin formed by the paint, which is the white substance with the highest refractive index. "Our idea basically was to introduce particles that contain spaces filled with air, with dimensions that are hundreds of nanometers, by using aluminum phosphate", says Galembeck. With the development of the new pigment, the researchers also discovered that the phosphate does not catalyze in the re-

THE PROJECT

New inorganic and hybrid pigments based on phosphates

MODALITY

Partnership for Technological Innovation Program (PITE)

COORDINATOR

FERNANDO GALEMBECK - Unicamp

INVESTMENT

R\$ 25,915.30 and US\$ 107,132.70 (FAPESP)
R\$ 67,340.00 (Serrana)

sins the oxidation brought about by the atmosphere, thus offering greater durability to the paint over its lifespan.

Initial study - The Biphor is a happy example of a basic research project carried out within a university that turned into a product that is reaching the market. "Everything began in 1988, with the start of the work on three dissertations and theses for masters and doctorate degrees, when we set about making up, in the laboratory, basic pigment. By 1994, our studies resulted in the register of three patents and some publications", recalls Galembeck. During this

was used to make improvements in our laboratories and in the operation of the electron microscope laboratory", says Galembeck. Between 1997 and 1998, the development of the pigment had the support of a project within FAPESP's Partnership for Technological Innovation Program (PTI).

From 1998 on, Bunge began to look into the market prospects and to carry out an evaluation of the product. But, during this period, Bunge sold two of the group's companies that worked in the chemical area: Tintas Coral and Quimbrasil. This resulted in a postponement of the decision to



period, the new idea produced three awards for Unicamp's IQ, two from the Brazilian Association of Paint Manufacturers and another from abroad, awarded by the International Association of Colloid and Interface Scientists (Iacis), an entity that brings together researchers who study the systems that form glues and gels, for example. During 1995, Serrana, a company within the Bunge group and a manufacturer of phosphate fertilizers, phosphate compounds for animal nutrition and phosphoric acid, took an interest in the phosphate aluminum pigments. Starting from this interest, a contract for the payment of the exclusive rights to the patents was established, which rendered around R\$ 600,000 to Unicamp's Development Foundation (Funcamp) between 1996 and 2005. "The money

manufacture the new product. In 2003, the project was reactivated and a new patent was deposited in 2004, with innovations incorporated after a sequence of studies. In 2005, with the decision taken to produce the new pigment and to launch globally, the 2004 patent was extended to a large number of countries, covering the new innovations in product, process and applications. The negotiations for the renewal of the initial contract (of 1995) were carried out by Unicamp's Innovation Agency (Inova), which maintained the royalties at 1.5% of the product's gross income for a period of 15 years, the validation time of the patents within the international environment. Of the royalties, one third will go to Unicamp, one third to the Chemistry Institute and one third to the group of researchers

responsible for the development of the new pigment.

The long journey made by Galembeck, followed up by *Pesquisa FAPESP* in issue 16 (still as *Notícias FAPESP*), and 58 and 97, has become a reference point in university-company relations and in the protection of discoveries by way of patents. "We have to preserve public interest when we carry out research in public universities", emphasizes Galembeck, who deposited his first patent in 1978. "It's possible to carry out science, publish scientific articles and at the same time preserve public assets. For this to happen, it is essential that public sector protects the ownership of knowledge generated with public funding and takes steps towards the use of knowledge to be paid through licensed companies, which transform knowledge into wealth." •