Aqueous Nanocomposites as a New Binder for Coatings

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This year's **FARBE & LACK prize** awarded by the German trade magazine of the same name has gone to BASF: Dr. Franca Tiarks and Dr. Jörg Leuninger from Polymer Research and Development Architectural Coatings in the Regional Business Unit Adhesives and Construction Industry Europe. The prize was awarded during this year's symposium of the coatings and pigments section (APi) of the Society of German Chemists (GDCh) held in Ulm, southern Germany. Franca Tiarks and Jörg Leuninger received their award for a paper entitled **"Aqueous Nanocomposites – dispersions of nano-structured silica-acrylate particles – a new generation of binders"**, co-authored by Dr. Harm Wiese from BASF's Polymer Research and Dr. Bernhard Schuler, head of Development, Architectural Coatings and Construction Chemicals.

The jury was convinced by the “originality, scientific significance, practice orientation and clarity of their work; their contribution received by far the highest number of points”, said Dr. Dirk Meine, FARBE & LACK science editor and jury member.

“We want to make our portfolio of established architectural coatings more attractive for our customers by specifically supplementing it with specialties. The research conducted by Franca Tiarks, Jörg Leuninger and others is making a key contribution to the launch of new products on the market and, as with this new study, to developing new approaches for innovative products of the future”, explained Ralph Schweens, head of the Regional Business Unit Adhesives and Construction Industry

Europe. “The FARBE & LACK award, which we are naturally very happy about, shows that our entire architectural coatings team produces outstanding work and that we were able to convince others of this, too.”

Nanocomposite-based films with favorable properties

Organic polymers such as pure acrylates or styrene acrylics are, in aqueous dispersion form, a key raw material for the production of environmentally friendly paints and coatings. They act as binders: after the paint has been applied, the water evaporates, the 100 to 150 nanometer-diameter polymer particles move together and form a flexible and above all transparent film. The basic idea was to improve the film properties by adding inorganic hard phases, in this case silica particles with a diameter of 10 to 20 nanometers. It emerged that improvements can only be made if the inorganic silica particles in the organic polymer particle of the aqueous dispersion have already been dispersed homogeneously. Thanks to BASF’s Polymer Research, these types of nanocomposite dispersions can be produced using a procedure called emulsion polymerization. The result? The nanocomposite-based polymer films display significantly improved properties:

-- increased indentation hardness
-- high elasticity despite high silica ratio
-- the polymer does not soften or flow before approx. 150°C
-- dries quickly after water absorption
-- no swelling during contact with water and therefore high resistance to whitening
-- high permeability to water vapor
-- flammable but does not drip

Ideal binders for wood stains or exterior paints

According to Dr. Alexander Haunschild, responsible for the marketing of architectural coatings in the Business Unit: “The properties of this new generation of binders means that our customers in the coating industry will have the opportunity of further enhancing end products such as wood stains or exterior paints.” A nanocomposite-based wood stain, he said, had been formulated with improved early blocking resistance and at the same time higher elasticity. For use in exterior paints, the product’s improved permeability to water vapor and excellent resistance to dirt are a particular advantage.

“Our current standard products have more than proven themselves for the production of high-performance coatings and paints and as a result are well established on the market. But we want to set new standards, innovations that will make our customers more successful. Just recently, we launched some new specialties for high-gloss paints and marble stone finishes on the market. With our nanocomposite dispersions, we actually have a completely new generation of binders in the pipeline”, explains Alexander Haunschild.

As a leading supplier of products for the construction industry, BASF develops, produces and markets polymer dispersions based on acrylates, styrene and butadiene. They are used for the production of textured finishes, finishing systems and compounds, advanced super plasticizer, roof coatings or ceramic tile adhesives for example. In paints and architectural coatings they are used as binders. BASF’s strengths include its efficient research and development and global application technology. The business is part of the Functional Polymers division within BASF’s performance products segment.