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INNOVATION AWARDS 2006

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The time has come to reveal the winners of the 2006 ICIS publications Innovation Awards, sponsored by Dow Corning for the third year running. We congratulate the four winning entries for their high degree of innovation and commercial value

JUDGING THE ICIS publications Innovation Awards is always a fascinating task, and this year was no exception. The panel of judges (see below) were impressed by the high quality of the science and innovation shown by the entrants and, in particular, the winning entries (see right).

And, as Gregg Zank of Dow Corning commented, many of them have the potential to be "significant in terms of commercial impact". This, the judges agree, is a fundamental part of innovation in the chemicals sector – not merely invention and development, but taking ideas and products successfully to market.

The winning companies and innovations cover a broad spectrum, mirroring the diversity of the chemical industry itself. On the one hand, the product category winner – German chemical major BASF – has come up with a near-classical piece of product development, using sound science and technology to develop a product that meets specific customer needs. That is, a plasticiser for flexible polyvinyl chloride (PVC) with a safer toxicological profile than conventional products.

The winner of the best innovation by a small and medium-sized enterprise (SME) also went to a German company, Sto, but a different type of concern to BASF. Sto specialises in architectural coatings and insulation, but it, too, has used very innovative classical chemistry to develop a photocatalytic pigment that operates in the visible end of the light spectrum, rather than needing ultraviolet wavelengths to operate.

Professor Rodney Townsend commented that: "There is a high quality of science underpinning the technology and the development was challenging." The result of the innovation – a coating that destroys organic pollutants in the atmosphere – has huge potential uptake, given today's concerns over air quality and human health.

On the other hand, the best process category was awarded to the US electronics arm of French industrial gases concern, Air Liquide, for its sophisticated development of laser ablation technology to enable the composition of semiconductor and ceramic materials to be measured to high accuracy. The judges were unanimously impressed by this innovation, especially, as Dr Andrea Tilche pointed out, for its potential impact on the burgeoning area of nanotechnology.

The award for the innovation with the best environmental impact went to Metabolix, a US biotechnology start-up, which specialises in using genetically modified bacteria to produce biodegradable polymers from renewable feedstocks. Dr Alfred Hackenberger acknowledged that Metabolix "is the benchmark in this area, achieving near theoretical yields" from its complex fermentation production. Again, concerns over oil shortages and plastics waste give this innovation a potentially huge market. Gregg Zank added that the development was "significant and impressive".

Paul Hodges noted that all the entries were very good and that many "got back to basic chemistry" for the kernel of the innovation. It was also, he added, difficult in many cases to distinguish between them, as "they all have a high level of commercial potential".

To see whether you agree, or not, the four winning innovations are all profiled in more depth in the following pages. If there is one message that can be drawn from this year's awards competition, it is that good innovation is alive and kicking in the chemical industry. What binds it all together is the quality of the science and the drive to meet customer needs.

» Editor's note: As BASF was shortlisted in the best product innovation category, Dr Alfred Hackenberger withdrew from the judge's discussion of this category.

THE WINNERS

Best product innovation
- BASF (Germany)
  Hexamoll DINCH PVC plasticiser

Best process innovation
- Air Liquide Electronics – Balazs Analytical Services (US) Practical use of laser ablation for materials analysis

Best environmental innovation
- Metabolix (US)
  Biodegradable natural polymers

Best innovation by an SME
- Sto (Germany)
  Photocatalytic pigment for pollution-destroying coatings

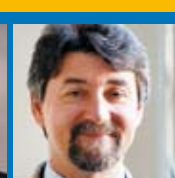
THE JUDGES

Dr Andrea Tilche
Head of environmental technologies and pollution prevention unit in DG Research – I.2, European Commission

Professor Rodney Townsend
Director of science and technology, Royal Society of Chemistry and Suschem board member

Gregg Zank
Vice president, chief technology officer and executive director of science and technology, Dow Corning

Paul Hodges
Chairman, International e-Chem



Dr Alfred Hackenberger
President, speciality chemicals research, BASF

Exceeding its own expectations

Air Liquide's US subsidiary, Balazs, has developed a novel process of materials analysis using laser abalation, combining innovative technology with what their customers want

IT IS always rather satisfying when one plus one equals more than two. And this has been the case for Balazs Analytical Services' development of its laser ablation ICP-MS analytical technique.

Balazs, the analytical arm of Air Liquide Electronics, has taken laser ablation technology and successfully coupled it with inductively coupled plasma-mass spectroscopy (ICP-MS) to create a technique that can effectively look inside materials. As such, it can provide an elemental survey or material identification – much more than any previous analytical technique.

> "Academia took a look at laser ablation as part of a study into laser-matter interaction mechanisms"
>
> **Fuhe Li,** research scientist, Balazs

Called Saris, the technology can provide qualitative analysis for up to 85 elements, with a detection level of 0.0001% (w/w), and quantitative analysis for up to 25 elements, with a detection level of 0.1–100ppm. One of the main advantages of the approach is that quantitative failure analysis can be performed without sample pre-treatment – allowing companies to get a quick analysis for major, minor and trace constituents in solid materials.

Another major advantage is the wide range of materials that can be analysed. These include conductive, nonconductive, homogeneous, heterogeneous, organic, inorganic, transparent and nontransparent materials. It can also be used to analyse materials that have proved difficult to crack using conventional techniques, such as insulating and refractory materials.

Fuhe Li, a Balazs research scientist, has been working on the project since its inception in 1997. He notes that originally, academia took a look at laser ablation as part of a study into laser-matter interaction mechanisms. The technique found some use in rock, soil and artefact analysis, where quantitative data were not required.

What Li and his colleagues at Balazs have done is develop an extensive calibration matrix, which can provide quantitative data from a wide range of samples. The resulting matrix-matched standards give data for materials in the 100ppb to 100ppm range.

Hugh Gotts, Balazs' R&D director, says that samples can be analysed in 15–30 minutes – a fraction of the time taken by traditional methods. "Some materials are difficult to prepare for analysis. For example, they do not dissolve or are lost when the sample is heated, so they cannot be analysed by traditional techniques. With Saris, the laser prepares the sample for you."

> "We provide customers a [with] written report giving technical information as to what the technology sees"
>
> **Hugh Gotts,** R&D director, Balazs

He adds: "We were getting so many unusual requests from customers looking to analyse non-routine substances or wanting depth information. We knew we could supply the answers. What we have done is interface what the technology does with what the customers want. The biggest hurdle to development was calibration – without good calibration you can not use the technology."

Between 2000 and 2001, Balazs started to commercialise the process. This involved building the equipment, which cost $530,000 (€425,000) and selling the technique as a service. Customers send samples to the company and are charged per sample or for the time it takes to conduct the analysis. "We provide customers [with] a written report giving technical information as to what the technology sees."

One of the applications Saris has been successfully used for is the analysis of ceramics for the semiconductor industry. This has been difficult in the past because as an insulating material, the ceramic has a charging effect on an ion or electron beam. Traditionally, scanning electron microscope energy dispersive X-ray (SEM-EDX) techniques could be used to detect high concentration contaminants, but could not detail trace levels or provide depth analysis.

"This information allows customers to build products that are much cleaner and understand why parts break," says Gotts. "The information we provide can also help our customers select suppliers – assessment of a number of polymers can tell them which is the cleaner or most like a material used previously." Applications are diverse. Customers use the technology to monitor clean air, develop advanced semiconductor precursors and determine diamond impurities, say Gotts and Li.

Now Balazs is looking to develop laser ablation ICP-MS into an accepted approach industry wide. "This means we need to educate people on how it works and where it can be applied," says Gotts. The company is also expanding into new areas, including medical and nanotechnology.

» For more details go to **www.balazs.com**