

GLOBAL PACKAGING RESEARCH

The international packaging research and education newsletter

Save Food extends its reach

Argentina, in the shape of its Institute of Packaging (IAE), is the latest country to embrace the Save Food initiative, backed by the World Packaging Organisation (WPO), an affiliate IAPRI member and partner in Save Food.

This month, the IAE hosted Argentina's first Save Food Conference, with the active involvement not only of the WPO but also the country's Ministry of Agriculture, food industry association COPAL, Unilever and Sealed Air, among others.



Speakers at the IAE's Save Food Day, including Silvio Colombo, third from right

"Loss and waste of food amounts to some 16 million tons per year, of which around 40% consists of fruit and vegetables," explained Silvio Colombo of the IAE, who opened the day with a presentation on packaging.

Food waste and loss in Argentina stands at 38kg per person per year, on average, compared to 25kg across Latin America and the Caribbean as a whole, he said. But both figures are much less than the average for the US and Europe (115kg).

Save Food will play a role in national efforts to co-ordinate work in this area at government level, among industry and academia.

Internationally, the Save Food initiative dates back some seven years, to when the UN's Food and Agriculture Organisation (FAO) teamed up with Messe Düsseldorf, Germany, the organisers of the interpack show, to work towards reducing food loss and waste globally.

www.packaging.com.ar
www.worldpackaging.org

Appointments to the Board

Frank Welle of Fraunhofer IVV, Germany, and Yves Wyser of Nestlé Research, Switzerland, are the most recent additions to the IAPRI Board, with more openings becoming available from next year.

Initially, IAPRI President Jay Singh will work with a Leadership Committee to identify qualified nominees, before putting forward

this shortlist to the full Board for its own selection. The Board's nominations will then go to a vote of the membership.

The 2019 Board openings will be for both Full Members and Corporate Members. Those interested in being considered by the Leadership Committee should submit their full résumé/CV to Secretary General Ed Church at sg@iapri.org

This issue:

News

1 *Save Food Argentina*
New IAPRI Board members

2 *Comment*
2019 IAPRI Symposium, Twente
Update on new IAPRI members

3 *New contact (and data standards) for ISTA*
Pack4Food seeks researcher
Laura Bix named assistant dean

Technology spotlight

4 *Novel materials would like to meet packaging applications*

Member profile

6 *Dow: reshaping an industry leader*

Comment

Corporate need

For the first time, IAPRI has elected a representative of a corporate member to the Board of Directors, showing a willingness to strengthen its links with industry. In addition, this trend has been underlined through the organisation of the Academia Meets Industry session, first staged at Zhuhai.

This does not mean, of course, that IAPRI should lose any of its focus on packaging research. On the contrary, stronger interaction between the research carried out in universities, research institutes and industry might help better align the excellent work performed by IAPRI members with actual market needs.

This is especially true when it comes to the development of new materials. How many of the first-class studies presented at the Zhuhai conference will make it to actual applications? Probably very few, if any.

While a few studies are quite far from what is actually needed, many are just a small pinch away from becoming true innovations. Additional insight in performance requirements, consumer expectations, regulatory requirements or a more holistic view on the packaging life cycle could help to bridge the gap between just being high-quality development work and becoming an actual application.

I strongly believe that by increasing somewhat the number of corporate members, and continuing to give strong opportunities for interaction and networking, IAPRI could be the ideal forum to achieve this alignment and to strengthen its contribution to making packaging even more relevant to what the market, but also society, ultimately needs.

This is what I will strive for in my role as corporate representative on the Board of this great association.

Yves Wyser, Nestlé

2019 IAPRI Symposium, Twente

With next year's IAPRI Symposium in Twente, Netherlands (11-14 June 2019), less than nine months away, members are reminded that abstracts for general-stream papers and complete papers for the peer-review stream should be submitted by December 7.



Meanwhile, the University of Twente, which is hosting the event, has confirmed the following keynote speakers: Chris Bruijnes of the Knowledge Institute for Sustainable Packaging (KIDV); Patrick van Baal from FrieslandCampina; Martin de Olde from Ardagh Group; and Agnieszka van Batavia from the LCA Centre.

Roland ten Klooster, who is responsible for Packaging Design and Management courses at Twente, explains that the Symposium title 'Serving Society: Innovative Perspectives on Packaging' is all about "bringing packaging back to the reasons why we pack".

"As packaging researchers, we have to explain more, and better, what we are doing and why packaging is needed (and when not)," he says. "We have to explain our role in society much better. The question we have to ask ourselves all the time is why we are executing this research, what the benefits are and how to explain this to society."

Ten Klooster adds: "Society is asking why we need packaging. Plastics especially are seen as the cause of many environmental problems."

www.iaprisymposium2019.org/

Update on new IAPRI members

No fewer than five new members have joined IAPRI since the end of last year, spanning university departments, independent test houses, corporate members and laboratory equipment providers.

Interest from North America remains strong. **Dow** joined towards the end of 2017 (see Member Profile, p6), and this year, IAPRI welcomed Canadian member **Ryerson University**, Toronto, and its School of Graphic Communications Management (GCM). Students with GCM as a major can follow an optional 'Concentration' on packaging.

Omya International is a global producer of industrial minerals headquartered in Switzerland. The company, which has over 8,000 employees across 50 countries, produces mainly fillers and pigments,

derived from calcium carbonate and dolomite, and also distributes specialty chemicals.

In Spain, **Safe Load Testing Technologies** offers a wide range of transport simulation options, aiming to improve quality, reduce damage and cost. Tests include horizontal stability, clamp, drop, compression, vibration, pitch & roll, impact, shock and data recording. The company is based in Valencia.

Finally, with its head office in Jinan, China, and international headquarters in Boston, USA, **Labthink Instruments** is a provider of laboratory test equipment and services for packaging manufacturers and consumer goods companies. Labthink says it has taken a lead in drafting more than 10 national standards and has over 100 patents to its name.

New contact (and data standards) for ISTA

The International Safe Transit Association (ISTA) has appointed Brian O'Banion as Vice President of Research and Education. He will also be the primary ISTA contact and representative for IAPRI.



Brian O'Banion

In a statement, the association said: "His focus will be the development, delivery and maintenance of educational programs relating to ISTA's mission, as well as the management and execution of ISTA's growing research efforts." When it comes to both areas, the emphasis will be on "long-range strategy and vision," it said.

O'Banion has 20 years of trade association management experience, involving packaging industry issues across areas including technical, environmental, health and safety. He has particular experience in food and beverage packaging technologies.

In a separate development, ISTA has launched a new set of data collection standards for use in conjunction with the development of its test protocols. VP Technical Eric Hiser

said: "Ensuring that field data is captured in a consistent and meaningful manner is important in creating laboratory tests that reasonably and effectively simulate real-world distribution hazards."

ISTA, based in Michigan, USA, said it hoped the standards would also encourage members of the transit testing community to work

with the association in "growing our data warehouse" as part of the collaborative effort to optimise transit packaging.

Importantly, ISTA said that it sees such standards as 'living documents' liable to evolve over time, and that it welcomes feedback from experts in this technical area, in the event that they would like to be involved in future revisions.

www.ista.org

'Ensuring that field data is captured in a consistent and meaningful manner is important'

Pack4Food seeks researcher

A research consortium including Pack4Food, based at the University of Ghent (UGent), Belgium, is looking for a PhD student to work on a four-year project investigating migration from glues and inks.

The project, ROMIL (Risk prioritisation and development of multi-method for analysis of migrating components from glues and inks), is funded by the Belgian Ministry of Public Health.

The consortium consists of Pack4Food, another lab within UGent's BioScience Engineering faculty and Primoris Belgium, a spinoff lab from the university.

Liesbeth Jacxsens, professor at UGent, said: "We are looking for an active, critical and competent PhD student with a strong affinity for analytics."

These skills would be directed towards compiling an inventory of components applied to packaging in the form of glues and inks, establishing their migration capacity in relation to food products and their toxicological profile.

A further objective will be the development of a multi-screening method for priority components, to be used in the screening and risk assessment of food products on the market.

Applicants will have recently graduated with a master's degree in chemistry, food technology, food science or pharmaceutical sciences.

Please contact Jacxsens for further details or to apply for the post: liesbeth.jacxsens@ugent.be

Laura Bix named assistant dean

Laura Bix, professor and associate director in the Michigan State University (MSU) School of Packaging, has taken up the additional position of assistant dean for teaching, learning and academic analytics within MSU's College of Agriculture and Natural Resources (CANR).

"This position provides me with the opportunity to help construct and support cultural change at MSU more expansively than I was able to do in prior roles," she said in a statement.

Bix added: "My workload will be a 50/50 split between the college and department, so I will still be actively working in the packaging field."

Having worked for her bachelor's, master's and doctorate degrees at the School of Packaging, she joined the faculty in 2002. Most of her research since then has related to healthcare products, via a multi-disciplinary program aimed principally at reducing medication errors and enhancing patient compliance.

The new position will focus on evidence-based decision making and expectation development related to teaching and learning within CANR "[using] learning analytics and interventions to help students succeed".

Novel materials would like to meet packaging applications

Those attending the IAPRI Conference in June heard how, from microcellular polymer blends to triboelectric nanogenerators and polymer nanocomposites, a new generation of functional materials is promising to rewrite the rules for packaging and its capabilities

Lih-Sheng (or Tom) Turng may be a professor and group leader at the University of Wisconsin-Madison in the US, and co-director of its Polymer Engineering Center, but when it comes to packaging, he modestly describes himself as “a new boy on the block, standing on the outside of the packaging arena looking in”

Whether or not that characterisation is judged to be accurate, Turng's keynote overview of some of the most exciting areas of materials innovation caught the imagination of many attending the June IAPRI Conference in Zhuhai. For a research audience used to working with a fixed range of materials with defined characteristics and behaviours, this is a bit like giving children the run of a toy store they are seeing (in some cases) for the first time.

Within polymer processing and engineering, though the base polymers may be familiar for the most part, he pointed to innovation in areas from modelling and simulation to foaming with gas-laden pellets and microcellular injection moulding (MIM), with or without in-mould decoration. He explained that MIM could be carried out by combining a single-phase polymer-gas solution (using supercritical N₂ or CO₂) with tight in-process pressure regulation.

Benefits of MIM include weight reduction in the pack or component, lower in-process clamp force, temperature and reduced energy consumption due to greater fluidity and shorter cycle times. To date, applications of MIM have largely been confined to the automotive sector and electronics such as printers and audio equipment.

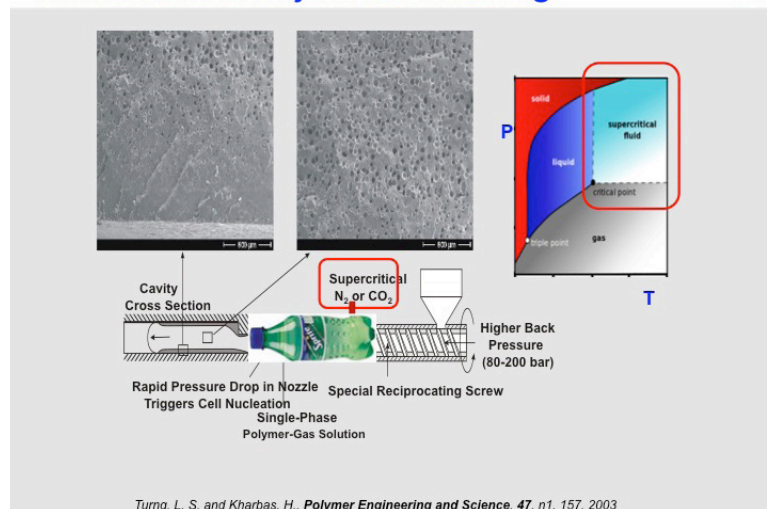
In terms of material characteristics, microcellular polymer blends such as 50/50 polypropylene (PP)/high density polyethylene (HDPE) and especially 75/25 PP/HDPE exhibit exceptionally high ductility and toughness, Turng reported.

Competence in composites

His keynote also examined possible functional benefits of using biochar (charcoal) in composites with linear low-density polyethylene (LLDPE) and ultra-high molecular weight polyethylene (UHMWPE). Such composites can be used for electromagnetic interference shielding.

Composites, including foams, with graphene as a functional

Microcellular Injection Molding



component could also offer benefits, in some cases, in packaging applications. “In our work, we have utilised the excellent electrical conductivity of graphene and the mechanical reinforcement that it could provide, in addition to its nucleating function to yield a fine microcellular structure for foams,” says Turng.

Highly compressible aerogels, which his team have researched, could be most useful in absorbing oil, for example in the aftermath of an oil spillage at sea.

Other material technologies have a more obvious applicability to packaging. By combining one aerogel layer with others of polymer/nanofibre, a triboelectric nanogenerator can be created, from which energy can be harvested. Triboelectric effects are based on friction between materials which develop positive and negative charges when rubbed.

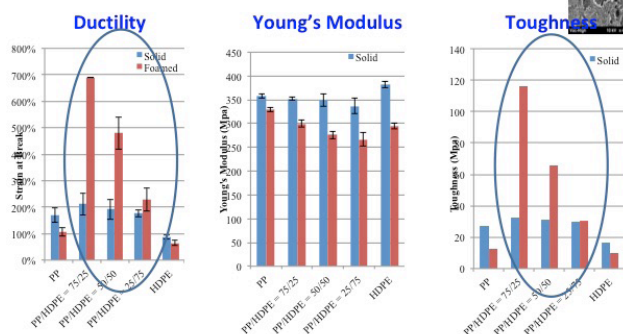
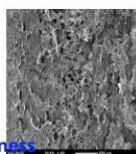
Turng explains: “The self-powered nanogenerator can be used as a sensor and power source to monitor and record the shaking and vibration history of a package in route during shipment.”

Other innovative materials mentioned by him in his Zhuhai keynote include highly stretchable, self-healing hydrogels. Could this, for example, allow the development of genuinely ‘resealable’ packages?

As Turng spells out, graphene offers some huge benefits in terms

Microcellular Polymer Blends with Super Ductility

- PP, PP/HDPE blends (75/25, 50/50, 25/75), HDPE
- Co-blowing agents (N_2 and CO_2)



Sun, X., Kharbas, H., Peng, J., and Turgut, L.-S., *Polymer*, 56, n15, 102, 2015

of the functionality of nanocomposites. At the June Conference, a paper authored by Chen Hu and Jian-Wei Yan, both from the Packaging Engineering Institute of Jinan University, specifically focused on the synthesis and characterisation of functionalised graphene and LDPE nanocomposite films.

Functions of graphene

Once standard graphene was adapted using the silane coupling agent KH-560 to create functional graphene, said the Jinan researchers, layer spacing in the functional variant increased dramatically, as did its disorder, with most of it forming a single layer (or very few layers). As they explained, this characteristic can be hugely beneficial for the uniform dispersion of functional graphene in polymers, for example.

The Jinan team demonstrated this capability in LDPE nanocomposite films formed by melt compounding and blow-moulding. They reported good compatibility between the polymer and the graphene, which dispersed uniformly and without agglomerating. At the same time, the functional graphene content improved the performance of the nanocomposite films. "When the content of functional graphene is 0.5%, the crystallinity and elastic modulus of the nanocomposite films are increased by 8.4% and 63.9% respectively, and the optical properties are also improved," they said.

Another Jinan research group, this time led by Qin-Bao Lin, examined the effects of surface-modified nano-titanium oxide/silver (TiO_2/Ag) on the properties of HDPE film. In this case, the titanate coupling agent NDZ-201 was grafted onto the powder surface to improve dispersal. With 2% added, lipophilicity in the nano- TiO_2/Ag reaches over 60%.

The team has detected the gradual migration of nanoscale titanium and silver within the polymer, but the relative difficulty with which they move may affect antibacterial applications. Since the hydrophobicity of the HDPE composite increases, the researchers speculate that this is as a result of some of the coupling agent gravitating to the surface of the film.

Additional innovation with nanocomposites came from Guangxi University, Nanning, China, where research presented at Zhuhai centred on cassava residue as a source of modified nanocellulose, used in combination with polylactide (PLA).

Both mechanical and chemical means were applied to create nanocellulose from cassava waste, dosed with phosphoric acid as the auxiliary agent. The resulting material was modified with stearic acid to increase its hydrophobicity and dispersability. The nanocellulose was added to PLA films as they were formed in concentrations of between 0% and 2%.

When the mechanical properties of these films were tested, a 0.5% proportion of nanocellulose did not yield good results, with decreases in the flexibility and elastic modulus of the film but only a modest increase in tensile strength.

"When 1% modified nanocellulose is added, the nanocellulose and PLA are tangled together through [their] molecular chains, and they co-crystallise to form a stable network structure," said the researchers. The resulting changes in the film's mechanical properties included a 40% increase in tensile strength and an increase in the elastic modulus of over 55%, while film flexibility decreased.

Nano-challenges

Other papers delivered at the Zhuhai Conference looked at some of the challenges around the new generation of polymer nanocomposites. Yining Xia from the Chinese Academy of Agricultural Sciences in Beijing proposed some strategies regarding the study of how nanoparticles are released from nanocomposites, the influence of particle size and other factors.

As the paper spelled out, there are significant concerns about the release of nanoparticles from the materials which contain them and about their potential impact on the environment and human health. Data on release patterns had focused on larger nanoparticles, Yining Xia argued, while in fact there is broad agreement across much research that particle size is the dominant factor in their release behaviour.

Even at the nano scale, there is a huge variation in particle size, from tens or hundreds of nm to quantum dots, which are typically below 10nm. The paper proposed: "Quantum dots could be a good candidate [for investigation], due to their extremely small size and luminescent qualities for easy tracking."

Many nanoparticles are too large to migrate through the polymer matrix, Yining Xia added. But quantum dots, which are semi-conducting particles or nanocrystals with a size range between 2nm and 10nm, would be a better starting point. In fact, current theories suggest that the size of nanoparticles needs to be further reduced to around 1nm radius (the size of many small molecules) to change release behaviour. Under these conditions, the research suggested it would be interesting to see whether the migration behaviour of nanoparticles and molecules was similar – or whether new models need to be established for nanoparticles.

Dow: reshaping an industry leader

A year ago, the merger of Dow Chemical Company and DuPont was completed, creating three companies specialising in different areas. Dow's Packaging and Specialty Plastics (P&SP) business is a new IAPRI member. Jill Martin, Fellow within P&SP, describes the company's R&D activities

Dow strives to be the most innovative, customer-centric, inclusive and sustainable materials science company in the world—one that is driven by world-class talent and enabled by leading products and technologies.

Dow pursues this ambition with industry-leading materials science capabilities and competitive cost positions applied to three attractive markets: consumer care, infrastructure and packaging. These sectors have strong consumer-driven demand trends, including: urbanization; growing middle-class populations, particularly in the emerging world; increasing demand for sustainable solutions that support a circular economy and lower energy intensity; and faster value chain interactions that are driving demands for digital business models and sharper data insights.

'We will ensure the value chain delivers more reliable and durable, higher performing, and more sustainable plastics to customers in food and specialty packaging'

The Dow businesses have a long history of delivering market-driven and value-added products and technologies to customers and the end-markets they serve. Dow's product offerings are enhanced by proprietary technology capabilities, which include: high throughput research; catalyst discovery and development; polymer and materials science; rapid prototyping; and process and engineering development. These capabilities are utilized at state-of-the-art laboratories around the world, which leverage a global set of capabilities and expertise to deliver local solutions.

Dow will maintain a focus on innovation and capitalize on growth and value-add materials science opportunities between Dow's technology platforms by leveraging Dow's leading R&D and process technology capabilities to quickly adapt and innovate for the benefit of Dow's customers and value chain partners through developing new and next generation products, formulations and novel solutions.



Specifically Dow's Packaging & Specialty Plastics operating segment is a world leader in plastics and consists of two highly integrated global businesses: Hydrocarbons & Energy and Packaging & Specialty Plastics. The segment employs the industry's broadest polyolefin product portfolio, supported by Dow's proprietary catalyst and manufacturing process technologies, to ensure the value chain delivers more reliable and durable, higher performing, and more sustainable plastics to customers in food and specialty packaging; industrial and consumer packaging; health and hygiene; caps, closures and pipe applications; consumer durables; and infrastructure.

Dow's track record of collaboration and customer knowledge has made it the go-to partner in its core end-markets of consumer care, infrastructure and packaging. Dow serves approximately 23,000 customers in more than 150 countries around the world. Many of Dow's commercial, logistics and industrial relationships have been in place for decades and are based on a proven value proposition of safely and reliably supplying unique products and technologies. Knowledge of customers' business needs—and the eventual consumers' needs—is at the core of Dow's R&D activities. Dow also utilizes numerous digital technologies, from advanced analytics to artificial intelligence, throughout its commercial organization, providing market insights into consumer trends and enabling Dow to better serve customers.

'Hybrid technologies will take advantage of the benefits between technology platforms to deliver unique product properties with superior performance.'

Going forward, Dow's technology and development goals will be focused on: manufacturing process improvements to reduce costs; higher overall value-in-use; and hybrid technologies that take advantage of the benefits between technology platforms to deliver unique product properties with superior performance.

www.dow.com

www.iapri.org International Association of Packaging Research Institutes

IAPRI was established in 1971 as an international membership association to promote packaging research. It is a unique global network which allows organisations to communicate and develop ideas, exchange experiences and in many cases reduce duplication of effort.

For more information please contact: IAPRI Secretary General, Ed Church e: sg@iapri.org

To contribute to the next issue of 'global packaging research', please contact Editor Paul Gander e: paul@gander123.plus.com

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