Greener materials

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In creating, designing, optimising and evaluating green materials, it is important to remember that we work in an essentially comparative field. There is no perfect material or polymer that offers ultimate performance and zero environmental impact. Chemists, physicists and engineers working at the forefront of this field are instead pioneering *improvements*. This quest to develop materials or processes that offer an inherent competitive advantage to the sustainability of our physical world is what drives this science forward. In this light, there is no 'green' solution to materials science, rather we are developing 'greener' solutions. How much we have improved over an existing product or process is often a challenging question to answer. Simple metrics developed in the wake of the green chemistry movement (atom economy, E-factors, Q-factors) can be coupled with life cycle assessments (LCAs) to provide a clear picture of how far we've come and how far we still need to go. We welcome future submissions that are assessment-focused, especially those that critically address our preconceptions about sustainability and green materials.

As editor-in-chief, I am always impressed with both the diversity of *Green Materials* submissions and the effort that these authors make to improve the sustainability of materials and polymer science. This issue is no different. The first paper, contributed by Emmanuelle Reynaud and co-workers from the University of Massachusetts Lowell, features renewable replacements to formaldehyde binders in engineered wood products, where polyamine cross-linked epoxidised linseed oil show exceptional performance.¹ The second details the rheological characterisation of silk solutions, expanding on our understanding of the properties and processing of this intriguing material, pioneered by Thomas Scheibel's team in the Lehrstuhl Biomaterialien at the Universität Bayreuth.² The Mecerreyes' laboratory at the University of the Basque Country present their work on new odourless pressure-sensitive adhesives based on renewable protic ionic liquid derived latexes³ while Brian Wagner's group at the University of Prince Edward Island (full disclosure: I'm a co-author) presents an evaluation of different synthetic strategies to biodegradable star-shaped polymers with cyclodextrin cores.⁴ Finally, Chi-Sun Poon discloses the optimisation of waste

cathode ray tube funnel glass in concrete blocks by altering aggregate-to-cement ratios.⁵

Together, they are five papers in five very different fields of study from five countries (USA, Germany, Spain, Canada and China) and represent five important contributions to *Green Materials*. As a synthetic inorganic and polymer chemist by training, I am certainly using the opportunity to read these articles to expanding my understanding of the vast world of green and sustainable materials science. I invite you to do the same.

Looking forward, we have more excitement to come. In recognition of the opportunity that a young journal has in focusing on niche subjects, we will feature two themed issues this year. Our first such issue is entitled 'Carbon dioxide responsive switchable materials' and led by guest editors Michael Cunningham and Philip Jessop from Queen's University in Canada. This issue will bring together world-leading scientists developing green stimuli-responsive materials for both specialty and commodity applications. Importantly, these carbon dioxide responsive materials reversibly cycle their response through clean, atom-economic reactions between amines and plentiful carbon dioxide sources. Look out for these papers in mid-2014!

REFERENCES

1. Sivasubramanian, S.; Jafferji, K.; Schmidt, D. F.; Reynaud, E. A formaldehyde-free binder for engineered wood products. *Green Materials* **2014**, 2, 2–10.
2. Keerl, D.; Scheibel, T. Rheological characterization of silk solutions. *Green Materials* **2014**, 2, 11–23.
3. Fernandes, A. M.; Moreno, M.; Adboudzadeh, M. A.; Gracia, R.; Barandiaran, M. J.; Mecerreyes, D. Odorless polymer latexes based on renewable protic ionic liquids for pressure-sensitive adhesives. *Green Materials* **2014**, 2, 24–30.
4. Tennekone, G. K.; Wagner, B. D.; Shaver, M. P. Cyclodextrin-based biodegradable polymer stars: synthesis and fluorescence studies. *Green Materials* **2014**, 2, 31–42.
5. Ling, T-C.; Poon, C-S. Use of CRT funnel glass in concrete blocks prepared with different aggregate-to-cement ratios. *Green Materials* **2014**, 2, 43–52.