Green Materials
Volume 3 Issue GMAT2
Book Review
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Page 52 http://dx.doi.org/10.1680/gmat.15.00008
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Received 03/06/2015 Accepted 03/06/2015
Published online 06/06/2015

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ice Institution of Civil Engineers publishing

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Handbook of Green Materials: Processing Technologies, Properties and Applications

Eds: Kristiina Oksman, Aji P. Mathew, Alexander Bismarck, Orlando Rojas, Mohini Sain. Singapore: World Scientific, 2014, ISBN: 978-981-4566-45-2 (Hardback: £1043). ISBN: 978-981-4566-47-6 (ebook: £782), 1124 pp.

World Scientific has recently published a four-book set in their series in 'Materials and Energy' entitled the *Handbook of Green Materials*, with this particular contribution marked as volume 5 in the overall set. The books are edited by leading scientists in this growing field: Kristiina Oksman and Aji Mathew (Luleå University of Technology), Alexander Bismarck (Vienna University of Technology), Orlando Rojas (NC State University) and Mohini Sain (University of Toronto). The four books are loosely organised into themes encompassing much of front-line academic and industrial research in green materials. My goal as a reader and reviewer is much as I would expect for the target audience: to learn. Many of these specific sub-fields were new to me, and I am reviewing these books with that frame of mind.

The four books provide both a relatively up-to-date picture of specific research fields and a primer for those new to the field. The first book in the volume, *Bionanomaterials: separation processes, characterization and properties*, features a particular focus on cellulosic materials. In particular, the chapters on the rheological and microscopic characterisation of nanocellulose materials, authored by Guan Gong (Swerea SICOMP AB) and Robert Moon (Purdue University) respectively, were both interesting and compact enough for a non-expert to digest. The book also features welcome commentary on toxicity and health issues (Marja Pitkänen, VTT Technical Research Centre of Finland) and the industrialization of these new materials (Grégory Chauve, FPInnovations).

The second book in the volume is entitled *Bionanocomposites: processing, characterization and properties*. This particular book again has a strong focus on nanoscale cellulose and extends their application to composites with polymers, the chemical modification of cellulose materials with good coverage of their preparation and specialty applications. I gained more from this book in general and found particular utility in reading the nanocomposite interface characterisation chapter (Stephen Eichhorn, University of Exeter), their use as grafting from materials (Youssef Habibi, University of Mons) and in responsive composites (Mirta Aranguren, Universidad Nacional de Mar del Plata). While not all chapters are written with an exacting style, I found this refreshing – the individuality of each piece worked well.

The third book, entitled *Self- and direct-assembling of bionanomaterials*, was important, but perhaps betrayed a mismatch between title and content. Excellent contributions on a range of topics on membrane applications, emulsions, aerogels and elecrospinning seem more at home in the previous processing chapter. The most on-point contribution was a well-written chapter on the directed assembly of oriented cellulose by Emily Cranston (McMaster University).

The final book in the series is entitled *Biobased Composite Materials: Their Processing, Properties and Industrial Applications*. This chapter focused on extending beyond cellulose to other chemical backbones. These include lignin, poly(lactic acid), xylans, biobased polyurethanes, bio-derived polyethylene and natural rubbers. Reading this as a chemist, these chapters seemed short in their coverage compared to the extensive cellulose coverage. As a learning exercise, I enjoyed the industrial processing section that made up the second half of book four, especially in how essential it is to understand the processing of these new materials to approach commercial viability. The final chapter, which discussed the life cycle assessment of biobased materials, was an especially important inclusion (Tiina Pajula, VTT Technical Research Centre of Finland).

Overall, this is an impressive and timely contribution to the literature in the field of green materials. The articles are, in general, well written and referenced and are a good resource for experts and scientists with cognate knowledge bases. The series title *Handbook of Green Materials* implies a more comprehensive coverage than is provided in the four books – I think there could be an additional volume covering the broader scope of green materials as a suggestion for the next edition, hopefully aligning with our titular journal's scope – but it was an enjoyable read for a polymer chemist! I think that this series represents a good learning resource to those working in the broader green materials community and a highly recommended purchase for those working in the main research focus: cellulose.

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