CHEMISTRY OF MATERIALS

Editorial

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Organic Photovoltaics: An Early Innovator

Michael McGehee and the *Chemistry of Materials*' 1k Club

In this installment of our 1k Club series, which highlights papers with more than 1000 citations, we spoke with Michael D. McGehee (MM, Figure 1), who wrote a review for

Figure 1. Member of the *Chemistry of Materials* 1k Club, Michael D. McGehee, Stanford University.

Chemistry of Materials (CM) in 2004 entitled "Conjugated Polymer Photovoltaic Cells", with graduate student Kevin M. Coakley.[1] It was still very early for organic photovoltaics (OPV), and this review became the "go-to" article that drew together what was known at the time and defined many of the challenges; it became the jumping off point for many scientists starting their own research in the area of OPV. The review has been highly cited, 1771 times (Google Scholar)/1435 times (Web of Science),[2] which points to the profound influence it has had on the field. As can be seen in Figure 2, the review captured many of the themes that are still highly relevant a decade later, including understanding and controlling the function and morphology of the bulk heterojunction. Since the donor–acceptor bulk heterojunction in an OPV device must be multifunctional (i.e., it must absorb light, generate excitons, separate those excitons, and finally enable charge carrier extraction to the electrodes), the question for over a decade has been—which is better, random or highly ordered, and why? This review drew attention to this question, and other important concepts.

CM: At what stage of your academic career were you when submitted this manuscript to *Chemistry of Materials*? Who were the other authors on the paper, and at what stages were they? Where are they now?

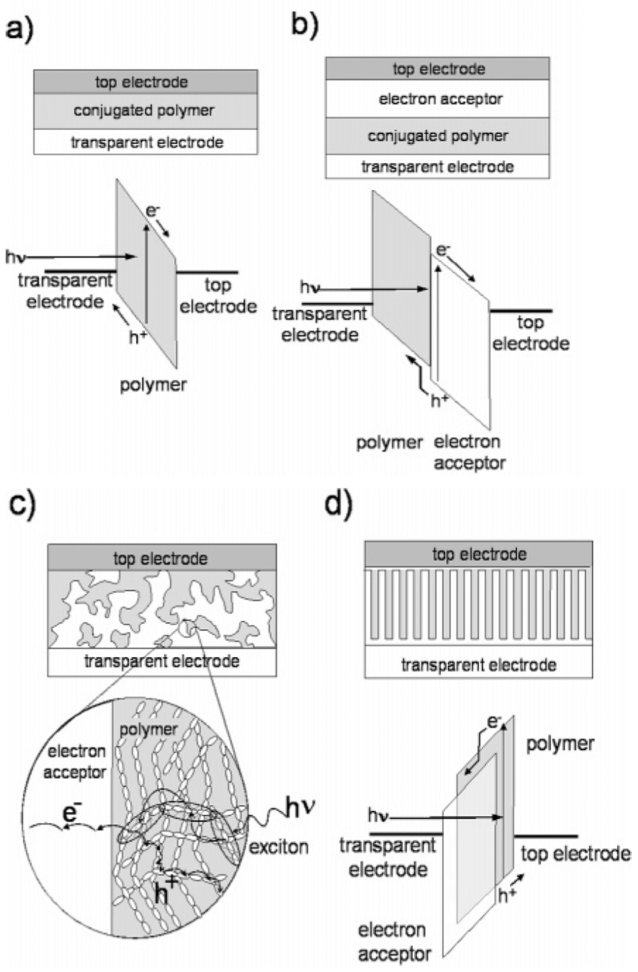

Figure 2. Four basic device architectures highlighting the different possible donor–acceptor morphologies in the bulk heterojunction, going from a single layer PV cell (a), to a bilayer structure (b), to the disordered but mixed heterojunction (c), to a highly ordered, interdigitated structure (d). Reproduced with permission from ref 1. Copyright 2004 American Chemical Society.

MM: I was a third-year assistant professor, and my coauthor was my first graduate student, Kevin Coakley. He founded a startup company after he graduated and is still running it.

CM: Given the high number of citations your review has accumulated, a significant quantity of research has been impacted by your findings over the years. Where did you think the field was headed when you wrote the paper? In your opinion, how has this particular research field evolved ever since?

MM: When we wrote the review, we expected that a lot of people were going to be interested in organic solar cells, but I

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think we slightly underestimated how popular the topic would become. I thought that it would be important to make well-ordered bulk heterojunctions to improve charge transport, but to my surprise relatively unordered bulk heterojunctions based on blends of polymers and fullerenes have turned out to result in better solar cells.

CM: If you had to put your finger on it, what made your paper special? What are you most happy about when you reread your paper?

MM: When I read the paper now, it seems really simple and naive. Our understanding of polymer solar cells has advanced so much in the past decade due to the hard work of hundreds of people. I think the paper has been cited many times because it was one of the first to clearly analyze what was known about how polymer solar cells function and assess how much more efficient they could be. I think the paper helped a lot of researchers figure out how they could use their skills to make better solar cells. It makes me happy that so many people were inspired to work on solar cells by reading the article.

CM: What is your advice to young scientists trying to discover the next breakthrough in material science?

MM: I think it is important to explore many potential research topics but to evaluate them quickly and only dedicate substantial amounts of time on projects that have a reasonably high chance of being successful and truly game changing. I also think it is important to do research in areas where one has a competitive advantage over most other people due to his or her experience, access to equipment, or collaborations. There are a lot of scientists doing research today and it is great to have your own niche. Starting research on polymer solar cells 4 to 5 years before the topic became popular is one of the best decisions I ever made.

Carlos Toro, Managing Editor
Jillian M. Buriak, Editor-in-Chief

AUTHOR INFORMATION

Notes

Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

REFERENCES

(1) Coakley, K. M.; McGehee, M. D. *Chem. Mater.* **2004**, *16*, 4533−4542.
(2) Citation data as of August 28, 2014.