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Understanding and Mitigating Recombination Loss in Organic Solar Cells

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We study recombination losses in organic photovoltaics occurring at both the donor/acceptor interface within a bulk heterojunction, as well as at the electrode contacts. In the bulk, we discuss how the interplay of energetics and morphology, particularly the size and connectivity of domains, can alter the ratio of free carriers to triplets. Turning to the active layer/electrode interface, we also show how surface fields generated at interfaces can be used to modulate recombination rates, and probe the role of structural heterogeneity in recombination at interfaces.