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**Controlling nanostructure in organic films to achieve high photovoltaic efficiency<sup>1</sup>**

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We discuss the materials and device structures used to attain high efficiency organic solar cells based on small molecular weight organic thin films. The influence of structural morphology introduced using both vacuum thermal evaporation and organic vapor phase deposition in so-called bulk heterojunction and mixed molecular heterojunction cells is described. Furthermore, we describe the growth of all-organic nanostructures by organic vapor phase deposition to achieve very high solar energy conversion efficiencies. Many of these approaches have potential for resulting in solar power conversion efficiencies >10%. In addition, materials and strategies for increasing the open circuit voltage, and to extend the sensitivity of organic solar cells out into the near infrared spectral region are discussed.

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