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**Effect of bridging atom identity on the morphology of solution-processed small molecule bulk heterojunction photovoltaics** GREGORY SU, NANCY EISENMENGER, GREGORY WELCH, GUILLERMO BAZAN, EDWARD KRAMER, MICHAEL CHABINYC, University of California Santa Barbara — Organic bulk heterojunction photovoltaics have gained much attention based on their potential to be low-cost, large area modules. Solution-processable small molecules are attractive materials due to their well-defined nature and purity. We examine two small molecules that differ by the identity of one atom: 5,5'-bis{7-(4-(5-hexylthiophen-2-yl)thiophen-2-yl)-[1,2,5]thiadiazolo[3,4-c]pyridine}-3,3'-di-2-ethylhexylsilylene -2,2'-bithiophene, ($\mathbf{SM}_{Si}$) and its carbon-bridged analog, ($\mathbf{SM}_{C}$). Despite having similar absorption spectra and energy levels, $\mathbf{SM}_{Si}$ and $\mathbf{SM}_{C}$ have different thermal transitions and device performance. $\mathbf{SM}_{Si}$ melts at 215 $^{\circ}$ C, while $\mathbf{SM}_{C}$ melts at 145 $^{\circ}$ C, and similarly annealed devices based on blends of $\mathbf{SM}_{Si}$ or $\mathbf{SM}_{C}$ with [6,6]-phenyl-$C_{71}$-butyric acid methyl ester ($PC_{71}BM$) show power conversion efficiencies of $\sim$3.4% and $\sim$1.0%, respectively. To determine the origin of this difference, techniques including grazing incidence wide angle X-ray scattering, UV-Visible spectroscopy, optical microscopy, and *in situ* current-voltage measurements were employed to monitor morphological changes during thermal annealing. $\mathbf{SM}_{C}$:$PC_{71}BM$ devices exhibit a greater propensity to crystallize into large domains upon annealing, which is detrimental to performance. These results highlight the connections among structure, morphology, and performance and provide insight into the design and characterization of photovoltaic materials.

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