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Mapping the nanoscale energetic landscape in conductive polymer films with spatially super-resolved exciton dynamics

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The migration of Frenkel excitons, tightly-bound electron-hole pairs, in polymeric organic semiconducting films is critical to the efficiency of bulk heterojunction solar cells. While these materials exhibit a high degree of structural heterogeneity on the nanoscale, traditional measurements of exciton diffusion lengths are performed on bulk samples. Since both the characteristic length scales of structural heterogeneity and the reported bulk diffusion lengths are smaller than the optical diffraction limit, we adapt far-field super-resolution fluorescence imaging to uncover the correlations between the structural and energetic landscapes that the excitons explore.