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Structure-performance analysis of donor/acceptor low band gap polymers: Effect of different acceptors LOUIS PEREZ, JAMES ROGERS, KRISTIN SCHMIDT, GUILLERMO BAZAN, EDWARD KRAMER, Materials Department UC-Santa Barbara, MATERIALS DEPARTMENT UC-SANTA BARBARA COLLABORATION — A well established method of designing low band gap polymers for bulk heterojunction solar cells employs what is known as a 'donor-acceptor' (D/A) motif. A D/A polymer is an alternating copolymer consisting of a covalently bound electron deficient unit as an electron acceptor and an electron rich component as an electron donor group. A notable D/A polymer, poly[2,6-(4,4-bis-(2-ethylhexyl)-4H-cyclopenta[2,1-b;3,4-b']-dithiophene)-alt-4,7-(2,1,3-benzothiadiazole)], (PCPDTBT) was the first to achieve device efficiencies over 5%. Device performance is predicted to improve by changing the acceptor to tune the energy level offsets between the polymers and the fullerene derivative to increase the driving force for exciton dissociation and the internal potential, (Voc). If the BT acceptor is changed to benzooxadiazole (BO) the Voc increases, however the current drops significantly, producing devices with efficiencies less than 2%. In order to understand the current drop, GIWAXS, NEXAFS, DSIMS, and TEM have been employed to elucidate structural and composition differences.

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