Organic semiconductors are a promising materials family for number of technologies including solar cells, LEDs, transistors and sensors. While these materials have been around for a while, their understanding has been hampered by the fact that they have not been studied in detail as “materials”. That is, the preeminent role of the microstructure has often been overlooked. In this seminar, I will present cases where we have conducted investigations precisely aimed at elucidating how the microstructure of organic semiconductors affects their properties. I will show results pertaining to the effect of grain-boundaries, degree of crystallinity and crystalline perfection on charge transport. I will also discuss how structural order controls the ability of organic semiconductors to generate a photocurrent in solar cells. Our work suggests that there are many opportunities to apply classical Materials Science concepts to advance our understanding of organic semiconductors.