The fact that the fossil fuel is finite and that the detrimental long-term effects of letting CO2 into our atmosphere exist, have created an enormous interest in developing new, cheap, renewable and less polluting energy resources. One of the most obvious abundant sources of energy in the solar system is the sun. Unfortunately the well developed silicon solar cells are very costly to produce. In an attempt to produce cheap and flexible solar cells, plastic solar cells have received a lot of attention in the last decades. There are still a lot of parameters to optimize if the plastic solar cell shall be able to compete with the silicon solar cells. One of the parameters is to ensure a high degree of charge carrier separation. Charge carrier separation only happen at heterojunctions, which cover for example the interfaces between the polymers and the electrodes or the interface between an n-conductor and a p-conductor. The facts that the charge carrier separation only happens at the heterojunctions limits the thickness of the active layer in solar cells and thereby the effectiveness of the solar cells. In this project the charge carrier separation is attempted optimized by making plastic solar cells with a molecular heterojunction. The molecular heterojunction has been obtained by synthesizing a three domain super molecular assembly termed NPN. NPN consists of two poly[1-(2,5-dioctyltolanyl)-ethynylene] chains (N-domains) coupled to the [10,20-bis(3,5-bistert-butylphenyl)-5,15-dibromoporphinato]zinc(II) (P-domain). It is shown that the N domains in NPN work as effective light harvesting antennas for the P domain and effectively transfer electrically generated excitons in the N domain to the P domain. Unfortunately the P domain does not separate the charge carriers but instead works as a charge carrier trap. This results in a performance of solar cells made of NPN that is much lower than the performance of solar cells made of pure poly[1-(2,5-dioctyltolanyl)-ethynylene]. On the other hand light emitting diodes, LEDs, made of Nn and NPN works very well. The LEDs made of Nn emits greenish blue light while LEDs made of NPN emits light in the near infrared region. During the synthesis of Nn and NPN it was found that remnants of the palladium catalysts caused problems in the control of the polymers and further made the resistance in the solar cells and LEDs so low that they did not work. A large effort has been made during the project to develop a method to remove remnants of metal catalysts from organic compounds and in particular polymers so that functional solar cells and LEDs could be made. It was succeeded to find a very effective method to remove remnants of metal catalysts from organic compounds by the discovery of the fact that azothioformamides are capable of dissolving metal nanoparticles by forming electron transfer complexes. Even metal wires of some metals can be dissolved by the azothioformamides within a reasonable time range.