The design of functional macromolecules: from energy conversion to therapeutics.

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The design of organic macromolecules for a variety of technological or medical applications is explored with several cases studies ranging from energy harvesting or conversion to chemotherapy or immunotherapy.

For example organic polymers or blends of polymers and small molecules are attractive for the conversion of light into energy, or energy into light. Therefore, site isolation of light emitting chromophores within block copolymers or discrete organic nanoparticles may be used to create organic white light emitting diodes based on a single multichromophoric organic layer. Similarly, light absorbing conjugated macromolecules may be designed for application in photovoltaics. In this instance molecules capable of transporting electrons must be combined with hole transporting molecules in blends for which the required critical control of phase morphology is achieved through molecular design.

Organic polymers and nanoparticles also show great potential as carriers for the delivery of drugs or other bioactive compounds. Here again molecular design is critical to achieve the desired function with issues of biocompatibility, degradability, targeting, and rate of release coming to the fore.

References.