Synthesis and characterization of novel phthalazine based push-pull heterocyclic systems for DSSC

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Abstract: Research on renewable energy sources and sustainable development have been expanding considerably in order to decrease the consumption of fossil fuels and therefore reduce global warming and environmental pollution. Solar energy is an excellent source due to its inexhaustibility and cleanness, and can be directly transformed into electric energy through photovoltaics, namely the most promising organic solar cells.

Solar cells based on organic dye sensitizers (DSSCs) adsorbed on monocrystalline TiO_2 electrodes have been extensively studied due to their high incident solar light-to-electricity conversion efficiency, colourful and decorative natures and low cost of production. Wide-ranging research has been conducted on structural modifications of the sensitizing dyes in the interest of achieving chromophores with high performance for DSSCs[1].

One approach for structural tuning consists on adjusting the π-bridge with electron rich and/or electron deficient aromatic rings that can perform as an auxiliary electron donor/acceptor group. Electron-rich thiophene and furan heterocycles linked to the electron-deficient phthalazine ring substituted with appropriate acceptor groups are promising candidates among such push-pull systems[1b, 2, 3].

As part of an on-going research to develop efficient donor – π-spacer – acceptor heterocyclic systems for several optoelectronic applications[2] we report the synthesis and characterization of phthalazine derivatives functionalized with cyanoacetic or rhodanine-3-acetic acid as anchoring groups. The experimental results indicate that, these compounds could have potential application as sensitizers for DSSCs.

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