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# Luminescent one-dimensional nanostructures of perylene bisimides

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Perylene bisimides form a unique class of organic semiconductors, in this investigation two symmetrical perylene bisimides caped with 1-butyl (B-PTCDI) and 4,4-diethoxybutyl (DB-PTCDI) have been synthesized and characterized. The compounds self-assembled as a network of nanobelts and nanorods in the solution based self-assembly process. Morphologies of these self-assembled structures were characterized by optical, fluorescence, scanning and transmission electronic microscopic techniques. One-dimensional self-assemblies of B-PTCDI and DB-PTCDI molecules are due to the strong π- π stacking ability of perylene core and assistance given by the side chains and solvent. Observed molecular self-assembly and electronic properties of the molecules. The observed self-assembly was supported by molecular modeling studies using density functional theory.

**Keywords:** Organic semiconductors; self-assembly; nanostructures; perylene bisimides; density functional theory.

## 1. Introduction

Design and self-assembly of organic molecules to form functional suprastructures is the main goal of supramolecular chemistry. During the past decade, the control of size, shape and crystal structure of organic functional materials has become the most highly energized research area for understanding their profound impact on chemical and physical properties [1, 2]. Self-assembly of nanometer-sized building blocks into ordered architectures at interfaces is an appropriate approach for efficient preparation of long-range ordered molecular aggregates and creating possible important materials with novel properties [3]. One-dimensional (1D)