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Synthesis and characterization of new helically chiral heptacyclic systems

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Abstract- New helically chiral heptacyclic systems with cyano groups at selected positions have been synthesized in good yields, *via* a four-step sequence, from readily available materials. The optical properties of the target helicenes were investigated by UV-visible absorption and photoluminescence spectroscopy and an emission in the visible region was observed. The energy levels of these organic materials were determined by cyclic voltammetry and showed a relatively high electronic affinity, indicating that they may be good candidates for electron-injection holeblocking layer in organic light-emitting diodes.
Keywords: Helicenes, Heck coupling, Photocyclization, Optical properties, Visible emission.

Carbohelicenes, represent an intriguing class of polycyclic aromatic hydrocarbons (PAHs) and are composed of *ortho*-fused aromatic rings with a fully conjugated system and a non-planar topology.[1] They have attracted great interest owing to their unique structural features and widespread potential applications as chiral luminescent materials,[2,3] or as building blocks for helical conjugated polymers.[4] They are also considered useful for wave guides,[5] non-linear optics,[6] biomolecular recognition[7] and asymmetric synthesis.[8] Helicenes were shown to be effective in the development of materials with chiroptical properties which are useful for molecular-based electronic applications.[9]

For instance, heptahelicene is a particularly interesting [*n*]helicene containing one complete turn of the helix and high optical stability (racemization barrier 40.5 kcal mol^{-1}).[10] Such heptacyclic structures have seen interest for their silver-binding interactions *via* the central cavity.[11] In addition, theoretical studies for alkali metal cations and transition metals have been established[12] and their deposition onto metal surfaces have also been investigated.[13]

Since Newman and Lednicer reported the first helicene in 1956,[14] various methods for the synthesis of helicenes including successive silylenol ether coupling with benzoquinone,[15]