Synthesis of Oligo(phenyleneethynylene)s with Vertically Disposed Tetrathiafulvalene Units

Functionalized oligo(phenyleneethynylene)s (OPEs) show potential as molecular wires for molecular electronics. A selection of OPEs with vertically disposed extended tetrathiafulvalene (TTF) units has been synthesized by a combination of metal-catalyzed cross-coupling and Wittig reactions. Two general synthetic routes were developed. In one route, the OPE scaffold was first constructed and finally the extended TTF units were incorporated by Wittig reactions. In the second route, the extended TTF module was first prepared and subsequently incorporated into an OPE backbone by palladium-catalyzed cross-coupling reactions. The latter route was employed for functionalization with protected thiol end-groups. Owing to the shape of these redox-active molecules, they are termed ‘OPE-TTF cruciforms’. The electronic properties were investigated by UV-Vis spectroscopy and by cyclic voltammetry.