Application of regioselective reactions of amine end-capped polyynes in organic and organometallic synthesis

Abstract

The synthesis and reactivity of polyynes has been widely a explored research topic during the last few decades due to unique properties of these molecules. However, examples of regioselective transformations of polyynes and their use as molecular precursors remain rather scarce. To date reactivity patterns of polyynes have been explored in two main areas: cycloaddition reactions and formation of transition-metals complexes.

The primary goal of this research was to perform regioselective reactions for amine end-capped polyynes, isolate new derivatives and study their spectroscopic properties and reactivity. As a result of the research, a series of ynamines with a carbon chain length up to octatetrayne was obtained. In the next thrust, ynamine compounds were reacted with i) sodium, ii) selenium and iii) tellurium sulfides. The resulting products were heterocyclic compounds, i.e. substituted thiophenes, selenophenes, and tellurophenes, which have many interesting applications, like for instance as building blocks in the synthesis of biologically active compounds.

In the next step, the reactivity of the amine end-capped group polyynes with tetracyanoethylene (TCNE), tetracyanoquinodimethane (TCNQ) and tetrathiafulvalene (TTF) was tested. The synthesis of these derivatives was interesting due to their unique electron-accepting ability and their strong non-linear absorption. Adducts of this type have applications in various fields, such as, for example, photovoltaic devices.

The additional motivation to take up this topic was the fact that in the vast majority of works that concern this class of compounds, only ynamines containing single triple bond in their structure are described. The research described here used polyyne compounds with two to four triple bonds in the carbon chain.

All new compounds were characterized with use of different spectroscopic methods especially ^{1}H and ^{13}C NMR and by single crystal X-ray diffraction if proper quality crystals were obtained.