

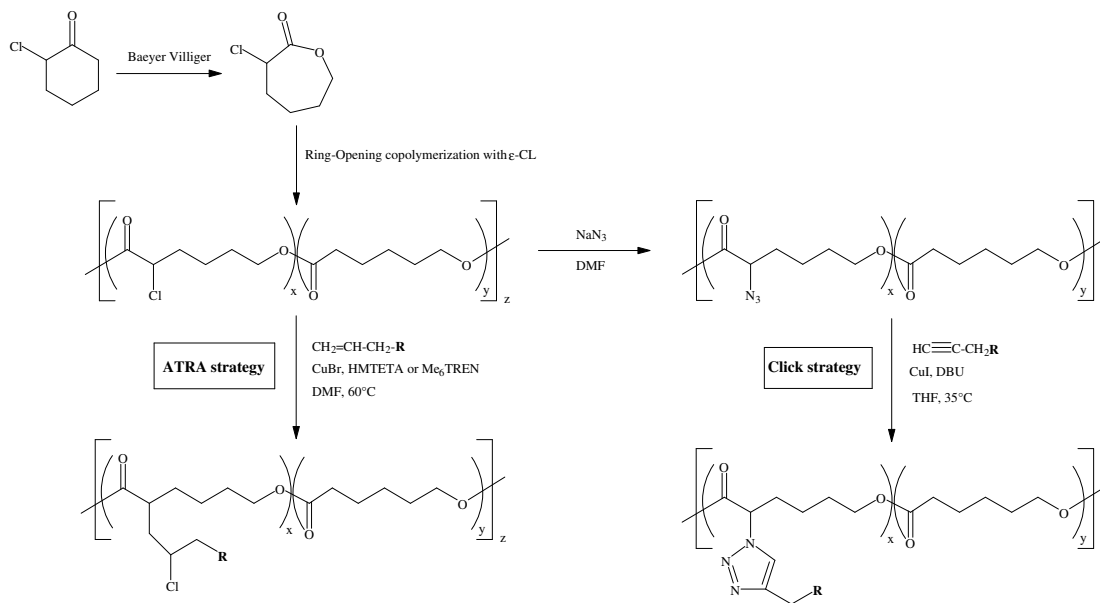
SYNTHESIS OF NEW SUBSTITUTED POLY(ϵ -CAPROLACTONE)S BY COMBINATION OF RING-OPENING POLYMERIZATION, ATOM TRANSFER RADICAL ADDITION AND CLICK REACTIONS

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During the last few years, a great research effort has been devoted to the synthesis of aliphatic polyesters, e.g. poly(ϵ -caprolactone) and polylactides. Indeed, their remarkable properties of biodegradability and biocompatibility pave the way to many new applications in the biomedical field and as substitutes for non degradable polymers. In order to tailor the polyester properties, the grafting of functional groups along the polymer backbone is highly desirable. For the last few years, CERM has reported on the synthesis and the (co)polymerization of novel ϵ -caprolactones γ -substituted by various functional groups, e.g., ketal, ketone, olefin, protected alcohol and carboxylic acid. Nevertheless, the grafting of a specific functional group onto the aliphatic polyester backbone requires the synthesis of the parent substituted ϵ -caprolactone. There is accordingly a need for a strategy that would use a unique substituted ϵ -caprolactone, followed by derivatization by well-established reactions, so making available a wide range of pendent functional groups, polymeric or not. The derivatization reactions have however to be quantitative under mild conditions to prevent the aliphatic polyester from degrading. Moreover, these reactions must be compatible with the functional groups of interest, e.g., hydroxyl and carboxylic acid, in order to avoid the use of cumbersome protection/deprotection reactions.

This communication aims at reporting that α -chloro- ϵ -caprolactone (α CL ϵ CL) can be easily copolymerized with ϵ CL into poly(α CL ϵ CL-co- ϵ CL) copolymers, which are precursors for various aliphatic polyesters, by using either Atom Transfer Radical Addition (ATRA) or Click reactions, according to the scheme shown below. The number of steps is limited whatever the "Click" or the "ATRA" strategy under consideration. In both cases, mild conditions have been found, such that degradation is minimized. Pendent hydroxyl, carboxylic acid and epoxide groups have been attached without using any protection/deprotection reaction.



R : polymeric or not, bears functional groups (epoxide, alcohol, ester, carboxylic acid)

This strategy has been implemented for the synthesis of amphiphilic poly(ϵ CL-*g*-ethylene oxide) graft copolymers, that have been used to prepare poly(D,L-lactide) nanoparticles for drug delivery applications.