Block Copolymers with Photocleavable Junctions

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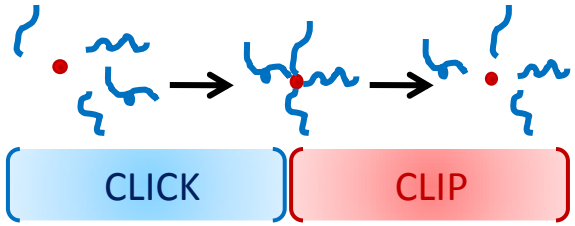
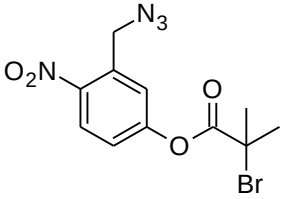
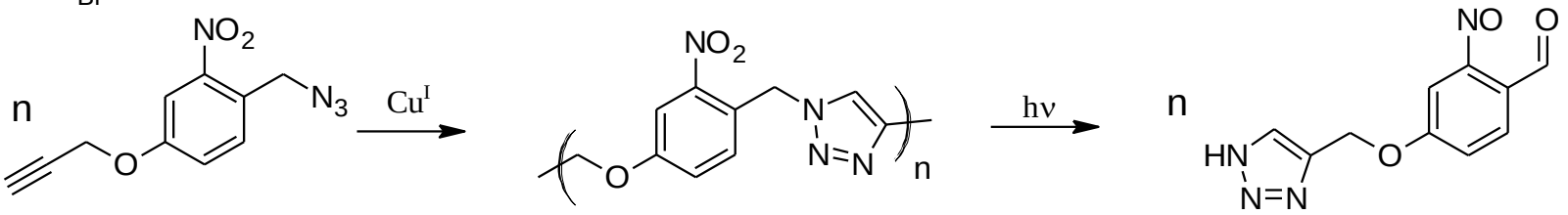




MAInZ: Mono-ATRP Initiator Azide

Copper-catalyzed azide-alkyne "click" chemistry is a powerful tool for assembling complex polymer architectures. By combining this reaction with the photocleavable family of *o*-nitrobenzyl linkers, we have designed the *o*-nitrobenzyl-1,2,3-triazole (ONBTz) linker that can be assembled by CuAAC click chemistry and cleaved with UV light, allowing us to use a "click/clip" paradigm to assemble complex polymer architectures and later selectively disassemble them using photocleavage. This chemistry can also be applied to recently-developed CuAAC/ATRP one-pot methods using MAInZ (see left) with various single- and multiple-functional alkynes.



The ONBTz linker can also be used to create a bulk photodegradable thermoplastic via click polymerization of the AB-style monomer seen above. The product polytriazole (PTz) has a T_g of 130 °C, and degrades on exposure to UV light. At right are two PTz films cast from DMF that were exposed to proof-of-concept lithographic patterning. Darkened areas were exposed to UV light, lighter areas were masked. The macro-level pattern (top) was reproduced with good fidelity. The micro-level pattern (bottom) was achieved by using copper TEM grids as masks. The inset photo (right) is a micrograph image of a single grid. Both the thick outer ring and the fine inner grid have been reproduced.