Hydration of alkynes in sub-critical water

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Chemical reactions in water at high pressure and high temperature (hydrothermal conditions) are prevalent in geochemistry and may have contributed to the origin of life . Hydrothermal chemistry is also important and useful in organic and inorganic syntheses, biomass conversion, biopolymer degradation, and aqueous waste stream remediation. Sub-critical water (sbcW), which the temperature is above about 200 ◦C, exhibits properties that are very different from those of ambient liquid water. It has a lower dielectric constant, fewer and weaker hydrogen bonds, and a higher ion product (Kw). Hydrolysis in sbcW is of special interest because water simultaneously is the solvent, reactant, and perhaps catalyst or catalyst precursor via self-dissociation. Hydrolysis reactions previously investigated in supercritical water include amines/imines, amides, nitriles, nitro compounds, esters, ethers, acetals , alkyl halides , anhydrides , silanes , and carbonates. The hydration of carbon-carbon triple bonds provides direct access to substituted ketones and aldehydes. Traditionally, toxic mercury(II) compounds were employed for the addition of water to alkynes, yielding the corresponding Markovnikov products. In this study, hydrolysis of a number of alkyn compounds has done and the conversion to ketone and dimer products was over 90% according to the amount of water used. Herein, we report the hydration of alkynes to give the corresponding carbonyl compounds represents a model of modern, sustainable transformation in chemistry: waste-free, water as reagent, and no catalysis used. Advantageously, this reaction, based on the incorporation of a water molecule, can be considered as an outstanding example of both atom economy and environmentally friendly synthetic method.