

Ultrasonic decomposition of cyanuric acid after water purification with salts of chlorined isocyanurates

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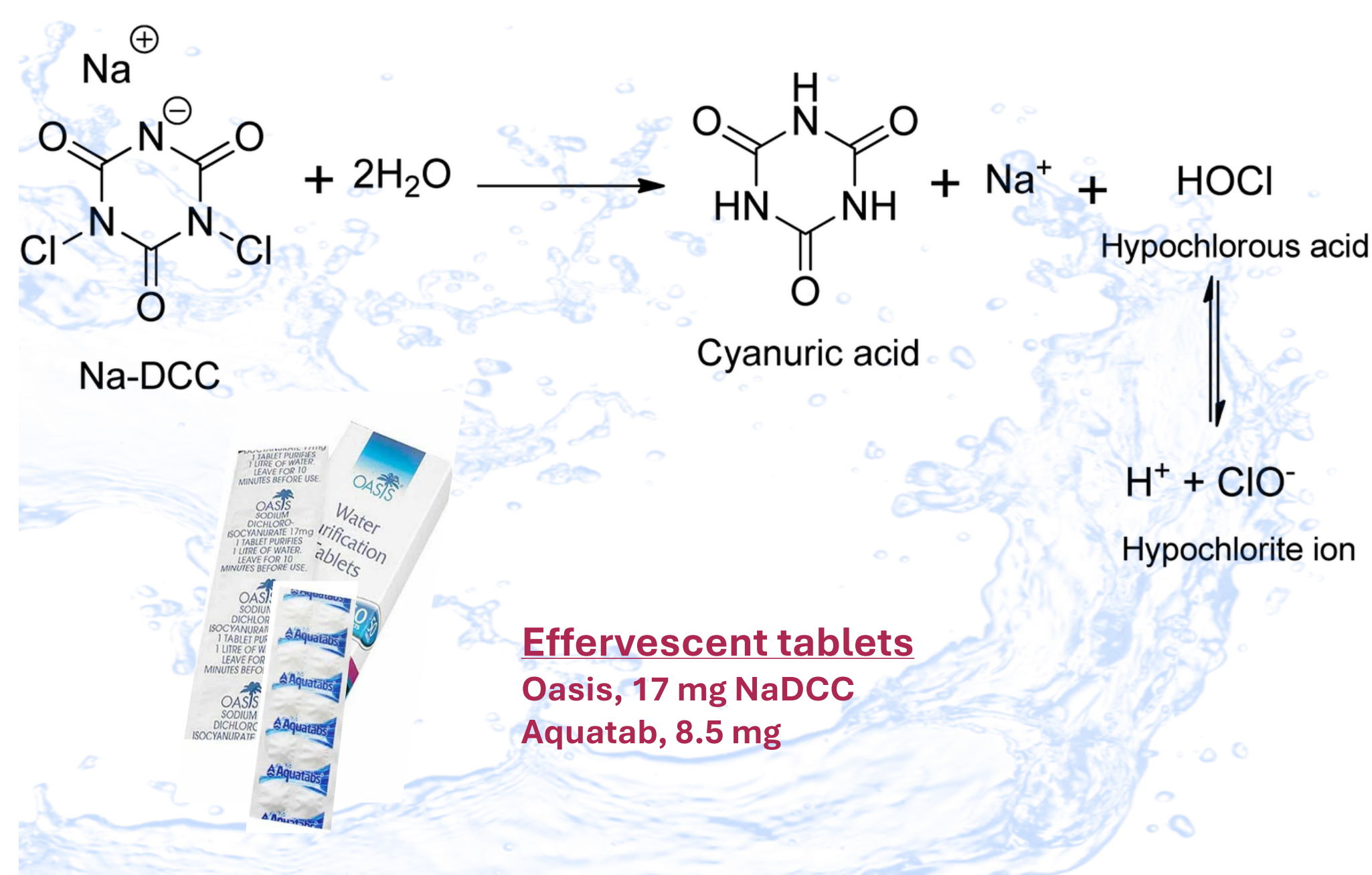


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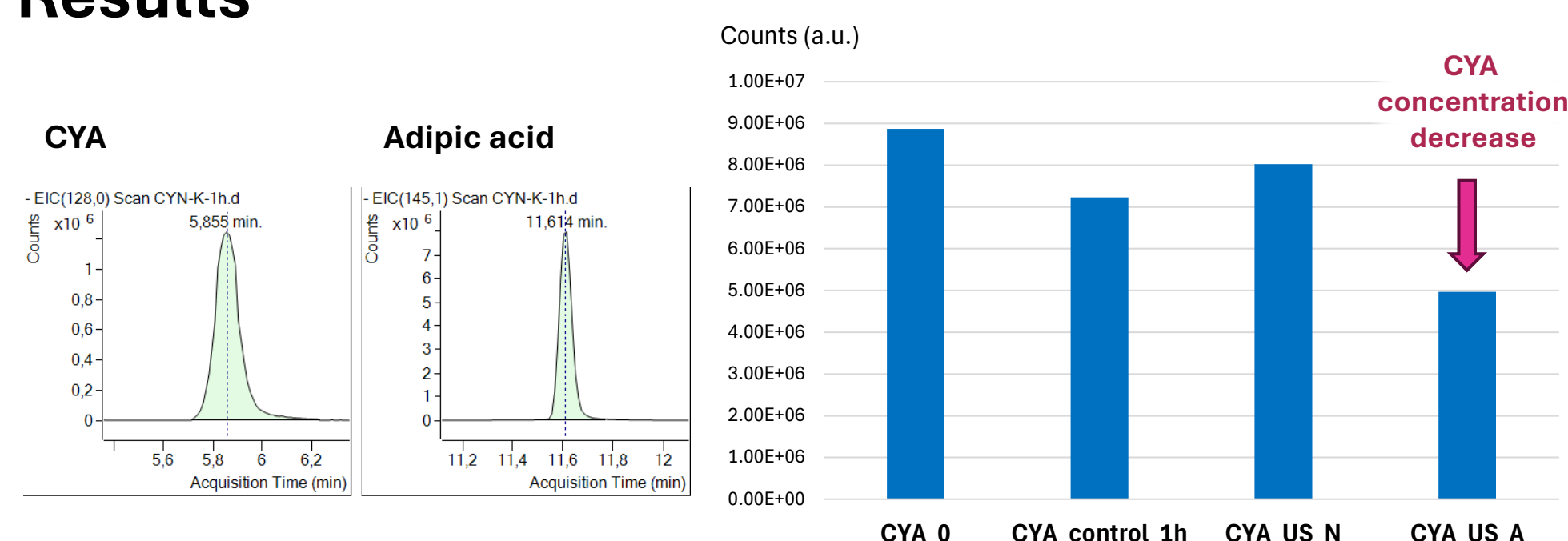
Ultrasonic degradation of cyanuric acid (CYA) represents a new aspect of water purification, crucial for reducing the concentration of CYA released into the environment, as well as reducing the harmful effects of chlorinated organic compounds left after water disinfection, particularly in swimming pools and industrial facilities. Chlorinated isocyanurates, such as sodium dichloroisocyanurate (NaDCC), are used as a source of free chlorine for water disinfection, leaving CYA as a byproduct. From a purification technology perspective, high concentrations of CYA can reduce the effectiveness of chlorine as a disinfectant, creating the need for its removal or degradation. From an environmental protection perspective, excess CYA leads to bioaccumulation and biomagnification, especially due to its very high resistance to degradation. Based on the hypothesis that CYA undergoes degradation under the influence of $H^\bullet$ radicals, ultrasonic degradation of CYA in aqueous solutions was investigated, as acoustic cavitation leads to the formation of various types of free radicals in water.

Ultrazvučna razgradnja cijanurne kiseline (dalje: CYA) predstavlja novi aspekt pročišćavanja voda, ključan za smanjenje koncentracije CYA koja se ispušta u okoliš, ali i smanjenje štetnih učinaka kloriranih organskih spojeva zaostalih nakon dezinfekcije vode, posebno u bazenima i industrijskim postrojenjima. Klorirani izocijanurati, poput natrijevog diklorizocijanurata (NaDCC), koriste se kao izvor slobodnog klora za dezinfekciju vode, ostavljajući CYA kao nusproizvod. S aspekta tehnologije pročišćavanja, visoke koncentracije CYA mogu smanjiti učinkovitost klora kao dezinfekcijskog sredstva, stvarajući potrebu za njenim uklanjanjem ili razgradnjom, dok s aspekta zaštite okoliša, višak CYA dovodi do bioakumulacije i biomagnifikacije, pogotovo zbog vrlo visoke otpornosti na razgradnju. U ovom radu, polazeći od hipoteze da CYA podliježe razgradnji pod djelovanjem $H^\bullet$ radikala, istraživana je ultrazvučna razgradnja CYA u vodenim otopinama, budući da akustična kavitacija dovodi do stvaranja više vrsta slobodnih radikala u vodi. Eksperimenti su provedeni u šaržnom reaktoru s ultrazvučnom sondom (100 W, 20 kHz) uz stalno hlađenje. CYA i produkti razgradnje analizirani su LC/Q-TOF/MS tehnikom. Preliminarnim istraživanjima utvrđena je razgradnja CYA i smanjenje njenog sadržaja u vodi te je potvrđena hipoteza da su često zanemareni $H^\bullet$ radikali ključni za razgradnju CYA, molekule otporne na $OH^\bullet$ radikale.

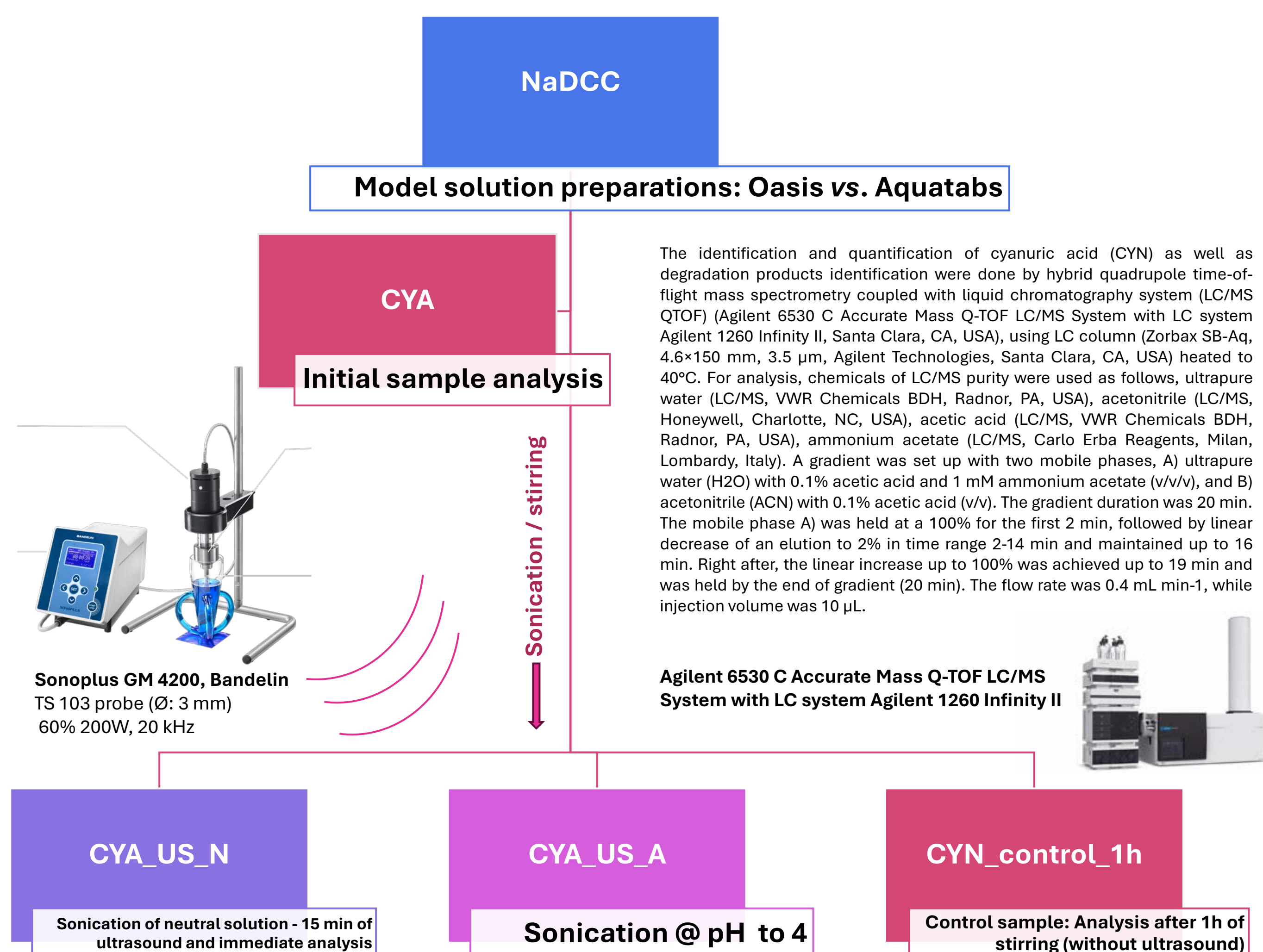
NaDCC in water



Results



Experimental flowchart



Preliminary research has determined the degradation of CYA and the reduction of its content in water, confirming the hypothesis that the often overlooked $H^\bullet$ radicals are crucial for the degradation of CYA, a molecule resistant to $OH^\bullet$ radicals.