OC-45: Using Pulsed-Wave Ultrasound to Evaluate Hydroxyl Radical Scavengers in Sonochemical Systems

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Hydroxyl radical (•OH) scavengers are commonly used in sonochemistry to probe the site and nature of reaction in aqueous cavitational systems. By using pulsed wave ultrasound we evaluated the performance of several different •OH scavengers in a sonochemical system to determine which •OH scavengers react only in bulk solution and which •OH scavengers interact with cavitation bubbles. The ability of each scavenger to interact with cavitation bubbles was assessed by comparing the pulse enhancement (PE) of 10 uM of a probe compound, carbamazepine (CBZ), in the presence and absence of a scavenger. Based on PE results, acetic acid/acetate appears to scavenge •OH in the bulk solution, and not interact with cavitation bubbles. Methanesulfonate acts as a reaction promoter, increasing rather than decreasing the degradation rate of CBZ. For formic acid, carbonic acid, terephthalic acid/terephthalate, benzenesulfonate, and iodide, the PE was significantly decreased compared to in the absence of the scavenger. These scavengers not only quench •OH in bulk solution but also affect the cavity interface. The robustness of acetic acid/acetate as a bulk •OH scavenger was explored for pH values between 3.5 and 8.9 and concentrations from 0.5 mM to 0.1 M.