

## Free Radical Dosimetry for Ultrasound in Terephthalic Acid Solutions Containing Gold Nanoparticles

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**Abstract :** When a liquid is irradiated with high intensities ( $> 1$  W) and low frequencies ( $\leq 1$  MHz) ultrasound, acoustic cavitation occurs. Acoustic cavitation generates free radicals from the breakdown of water and other molecules. The existence of particles in liquid provide nucleation sites for cavitation bubbles and lead to decrease the ultrasonic intensity threshold needed for cavitation onset. The study was designed to measure hydroxyl radicals in terephthalic acid solutions containing 30 nm gold nanoparticles in a near field of a 1 MHz sonotherapy probe. The effect of ultrasound irradiation parameters containing mode of sonication and ultrasound intensity in hydroxyl radicals production have been investigated by the spectrofluorometry method. Recorded fluorescence signal in terephthalic acid solution containing gold nanoparticles was higher than the terephthalic acid solution without gold nanoparticles. Also, the results showed that any increase in intensity of the sonication would be associated with an increase in the fluorescence intensity. Acoustic cavitation in the presence of gold nanoparticles has been introduced as a way for improving therapeutic effects on the tumors. Also, the terephthalic acid dosimetry is suitable for detecting and quantifying free hydroxyl radicals as a criterion of cavitation production over a range of condition in medical ultrasound fields.

**Keywords :** acoustic cavitation, gold nanoparticle, chemical dosimetry, terephthalic acid

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