Contribution ID: **12** Type: **墙报**

Formation and Stability of Bulk Nanobubbles Generated by β-ray Irradiation

Radiation is a kind of energy transmitted by waves or particles. It is ubiquitous and has an important influence on our daily life. As early as the 1950s , scientists has detected energetic charged particle tracks by observing the shape and distribution of bubbles generated by high-energy rays in the bubble chamber, which also provided help for the discovery of many new substances and new phenomena, such as new particles, resonant states, weak neutral flow. In this article, we reported for the first time that β-ray irradiation could generate bulk nanobubbles in pure water. The dose and time of radiation were investigated. It showed that those bulk nanobubbles are very stable and survive at least 24 hours once they formed. But they would decrease remarkably after degassing the solution, which proves that formed "nanoparticles" are real gas inside. The concentration of bulk nanoubbles produced differs from different places near the surface of water container. More nanobubbles would be produced near the surface than bulk. Our study provide the evidence that high-energy rays can produce bulk nanobubbles, which broadens the methods for producing nanobubbles and we hope that can be helpful to explore more applications of nanobubbles in the field of high energy physics.

Summary

Radiation is a kind of energy transmitted by waves or particles.It is ubiquitous and has an important influence on our daily life . As early as the 1950s , scientists has detected energetic charged particle tracks by observing the shape and distribution of bubbles generated by high-energy rays in the bubble chamber[1] , which also provided help for the discovery of many new substances and new phenomena , such as new particles , resonant states , weak neutral flow[2, 3]. Herein , we use β-ray irradiation to generate bulk nanobubbles in pure water . The properties and generation of bulk nanobubbles are studied comprehensively . We used nanoparticle tracking analysis to analyze the track and concentration of nanobubbles . Experimental results showed that sufficient bulk nanobubbles were generated and we have proven they are not contaminations . The relationship between the size and concentration of bulk nanobubbles and the irradiation time and irradiation dose was also investigated

提交摘要
Abstract

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Content *

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Primary author: 原, 恺薇 (19901633480)

Presenter: 原, 恺薇 (19901633480)