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Calcium carbonate theranostic agent in an ultrasound field

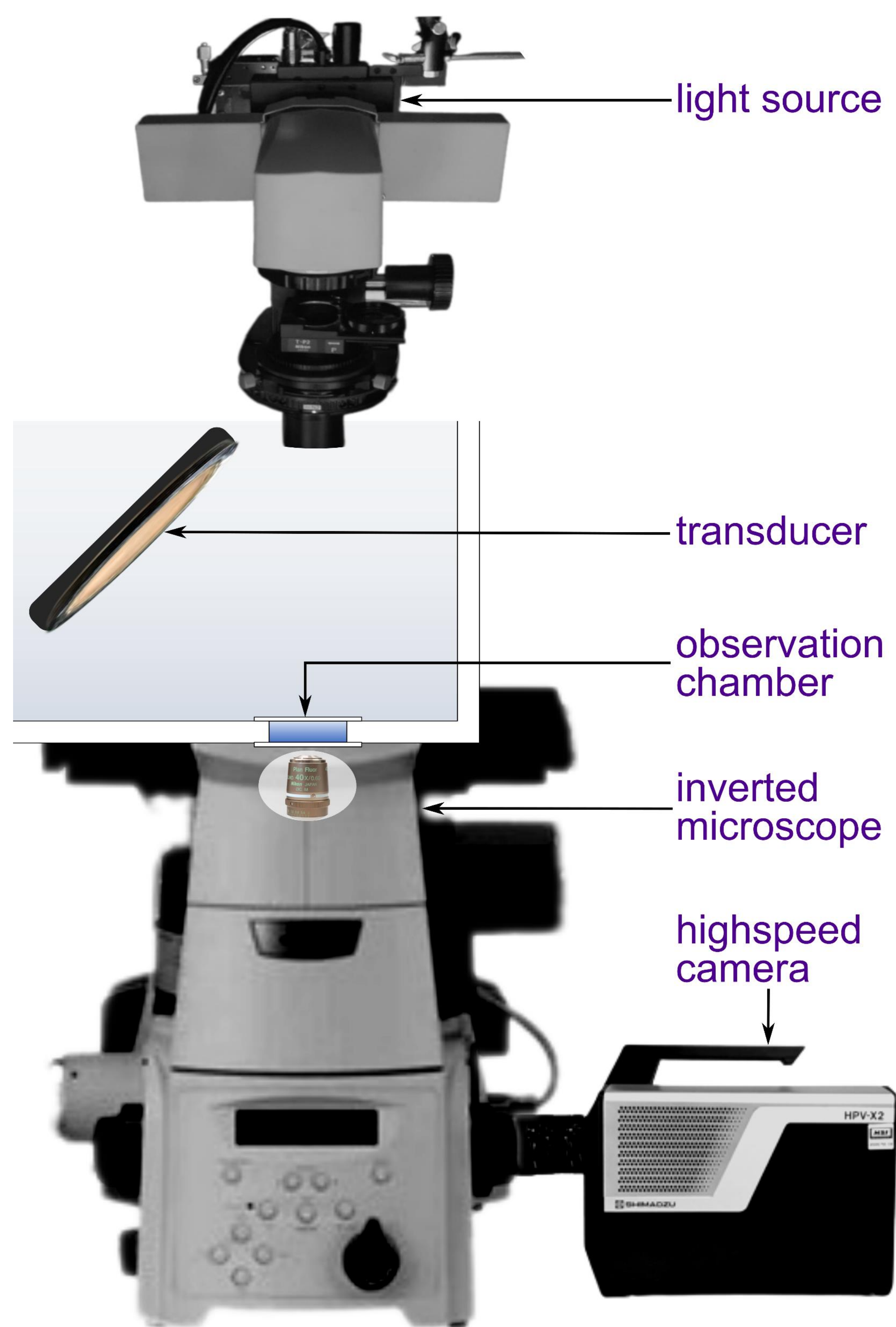
Nicole Anderton, Craig S. Carlson, Albert T. Poortinga, Momoka Yamasaku, Naoyuki Otake, Nobuki Kudo, and Michiel Postema

Theranostic agents are materials that act both as tracers during diagnostic imaging and as vehicles carrying and releasing therapeutics during treatment. Ultrasound-triggered theranostic agents comprise shell-encapsulated microbubbles that pulsate during low-amplitude sonication and release their payload upon higher-amplitude sonication. High-amplitude sonication may be undesirable due to unwanted side effects related to inertial cavitation. However, low-amplitude release from microbubbles typically requires thin encapsulating shells, which in turn may be permanently disrupted under diagnostic imaging conditions. The purpose of this study was to investigate a novel microbubble agent with thick shells composed of calcium carbonate.

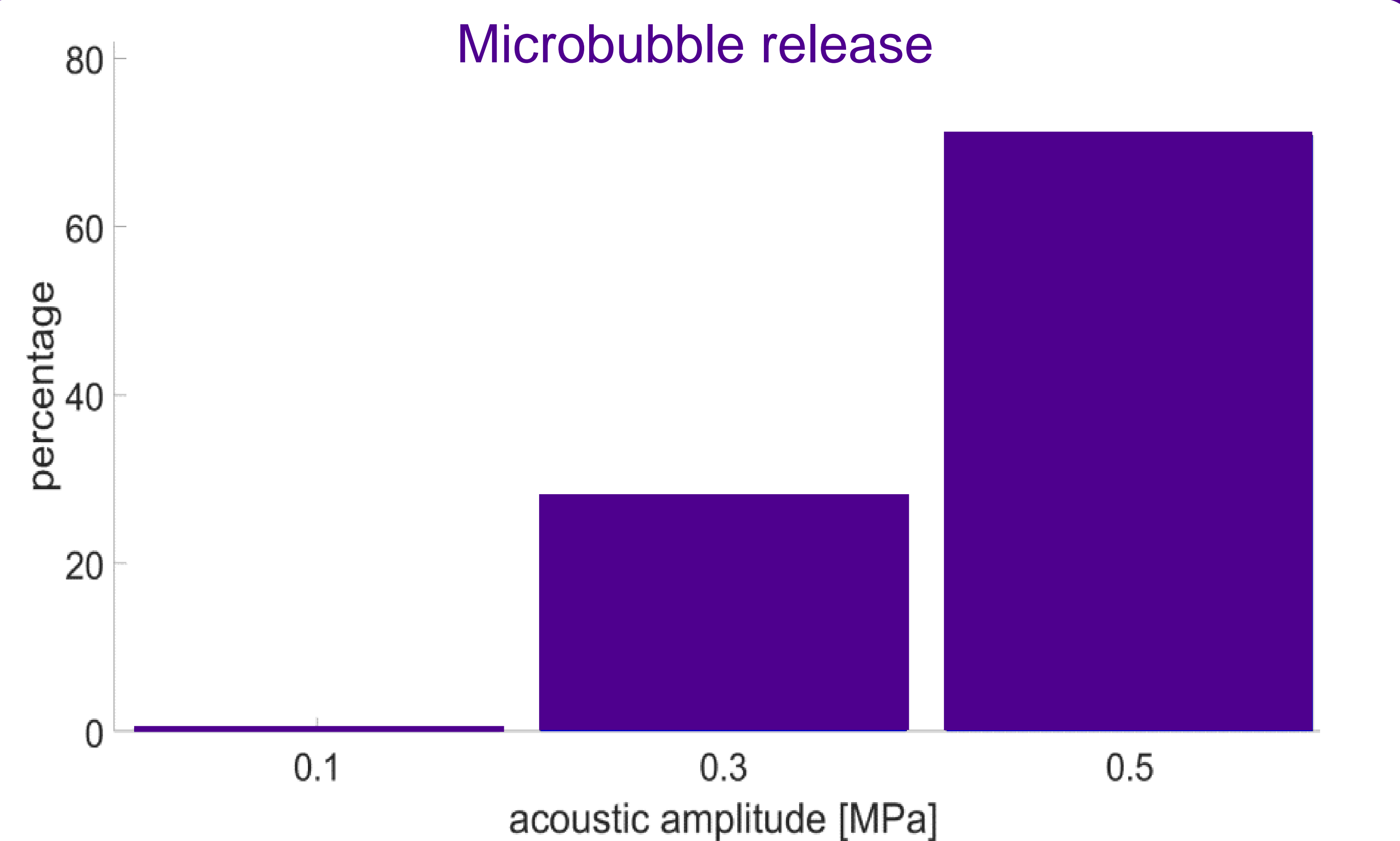
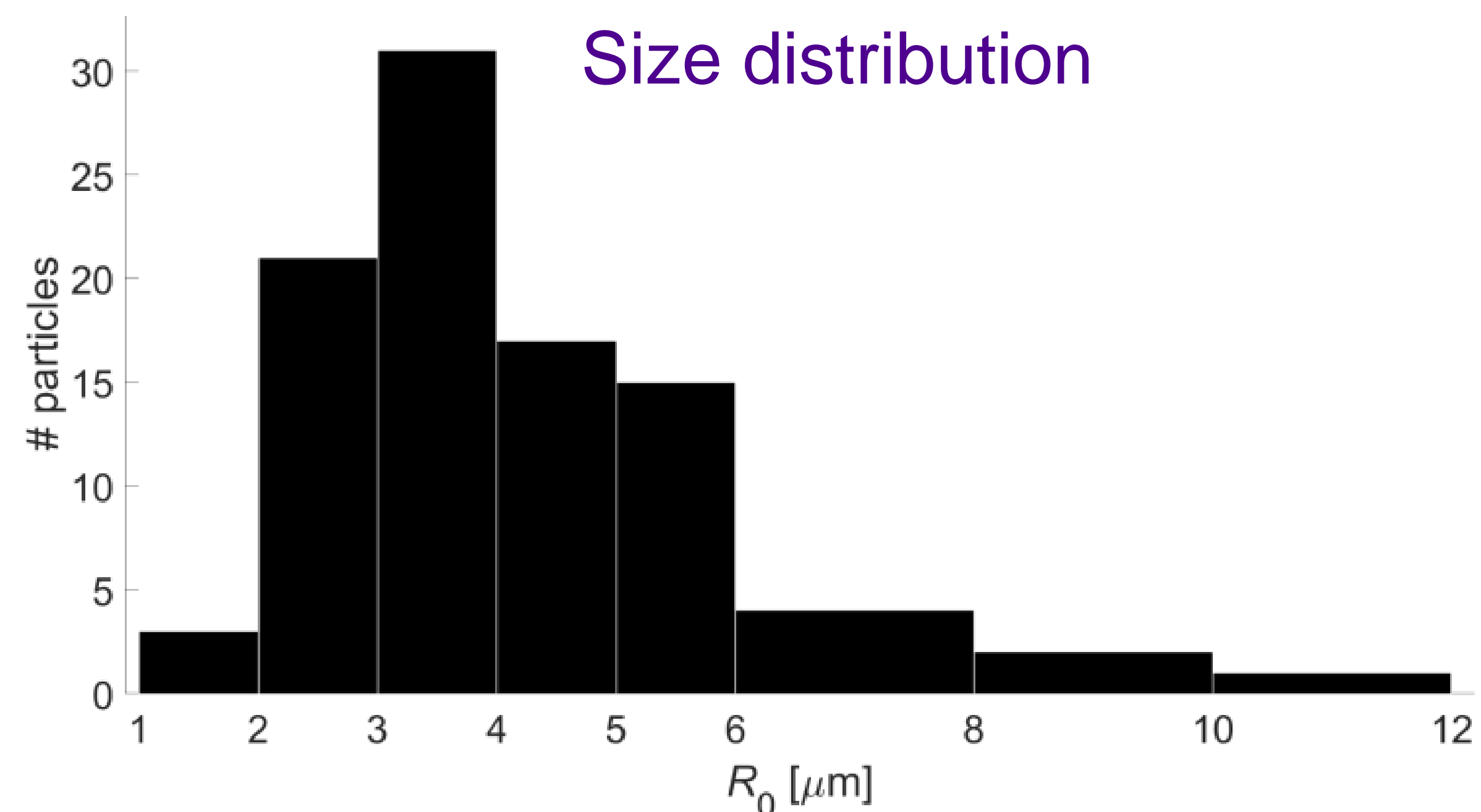
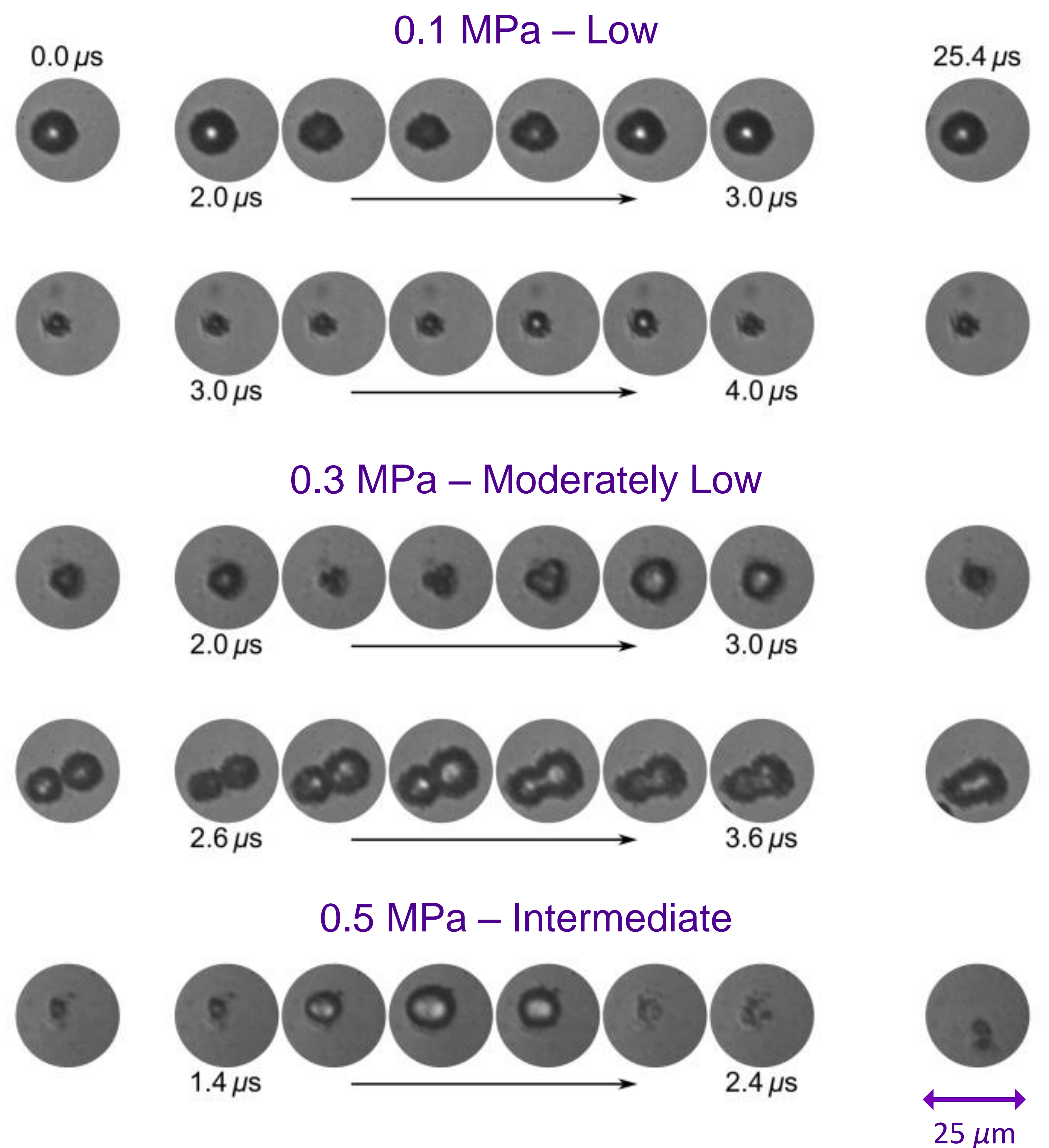
Materials and Methods

Sonication conditions:

- 1-MHz centre frequency;
- 3-cycle single pulse;
- 0.1–0.5-MPa peak-negative pressure.



Results



Conclusions

CaCO₃-coated microbubbles were observed to be stable scatterers when exposed to 0.1-MPa ultrasound. These bubbles were seen to release their contents at higher amplitudes below the inertial cavitation threshold.

Author statement

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