

Translating Microbubbles into Nano-Scale Phase-Change Contrast Agents

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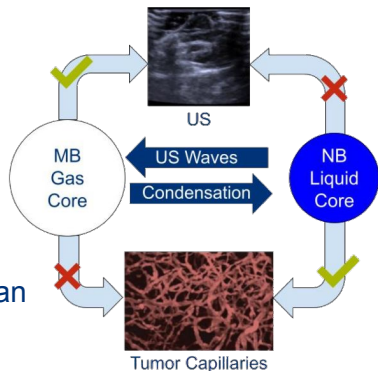
Problem

- Uniquely **nanobubbles (NBs)** can escape tumor vasculature
- But, only **microbubbles (MBs)** appear on **Ultrasound (US)** for tumor imaging

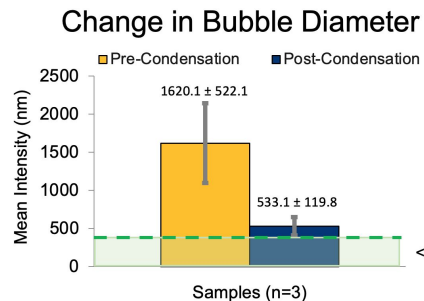
Need: To design an agent capable of shifting between MBs and NBs

Objective: Design a method to produce an agent that is capable of core **phase changes (PCs)** to alter bubble size

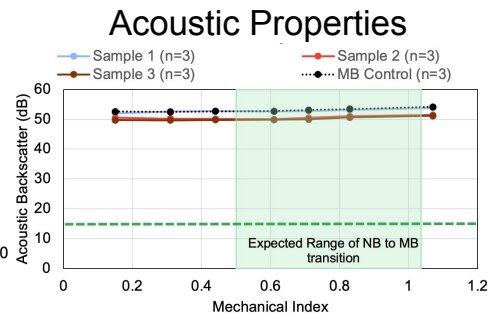
Requirements: <400 nm, >15 dBs of US backscatter



Results



Sizing of bubbles pre- and post-condensation procedure



US backscatter to return bubbles to micro-scale

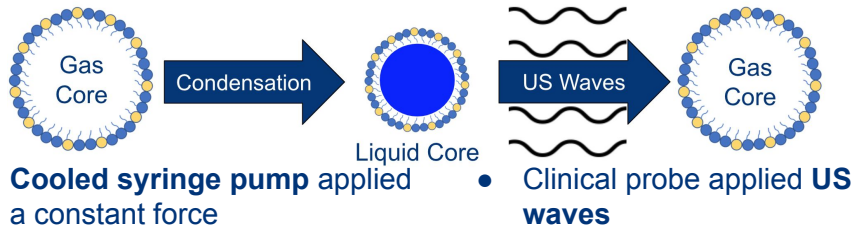
Result: Decreased size to 533.1 nm

Result: Matches MB Control

Design Solution

Solution: Reduce size by changing pressure and temperature

Innovation: Quantitative procedure for inducible phase changes



Impact

- Quantitative procedure with a low-cost pressure apparatus to induce core phase-changes
- Advancement of US for tumor imaging applications

Conclusion

- Successfully formed NBs
- Temperature-sensitive bubbles potentially reverted back to micro-scale
- Unconfirmed stability of nano-scale SE61