

Processing MRI Images of Bubbles Injected into Liquid Suspensions

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<u>Daniela Ayala</u>*, Alireza Bordbar**, Christopher M. Boyce*.

Department of Chemical Engineering

Introduction

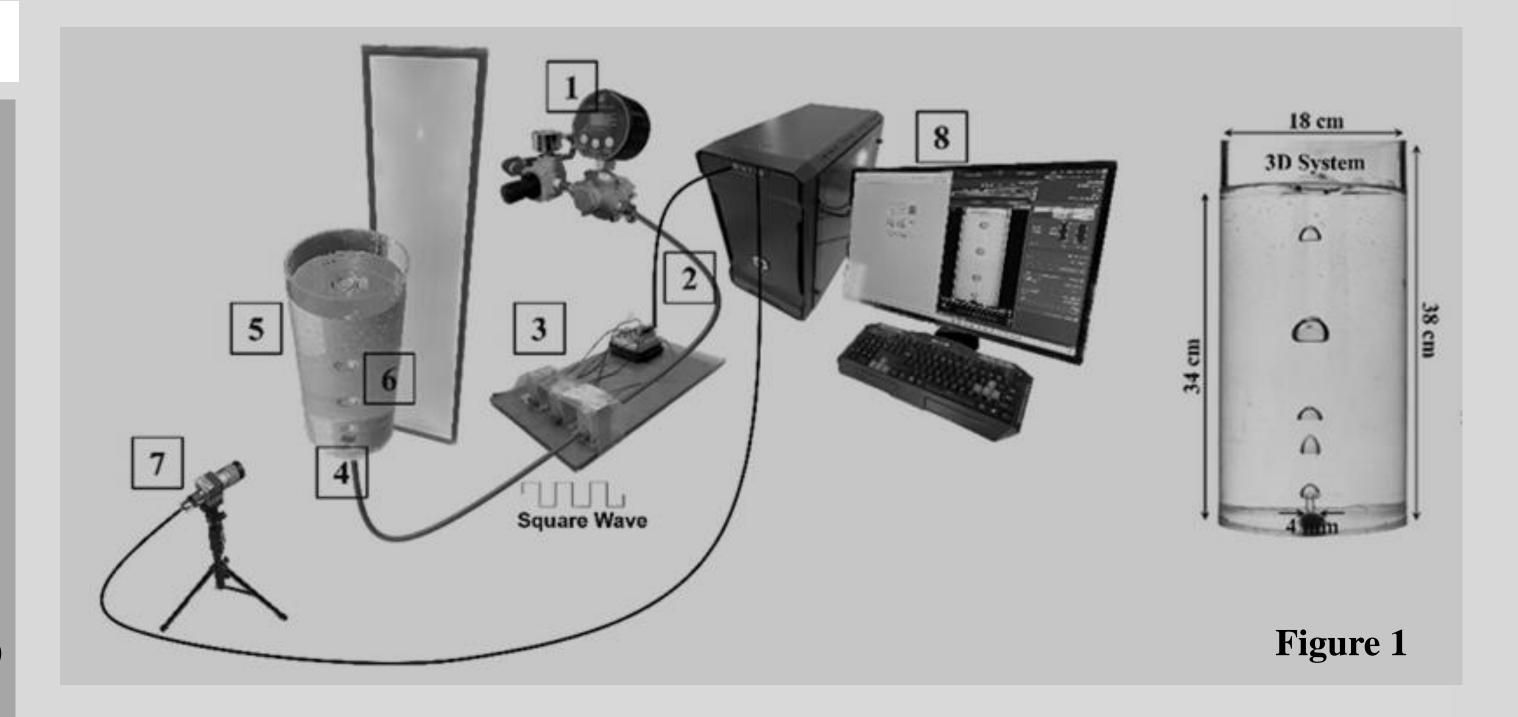
- Natural processes such as volcanoes involve rising, splitting, and coalescing bubbles in magma.
- Jets of bubbles injected through a nozzle in liquid are common in various industries.
- Goal: process MRI images of bubbles in high-viscosity silicone oil with sesame seed percentages (0%, 10%, and 20%) to detect "regular coalescence".
- Image enhancement is required for better clarity of displayed bubble patterns.

Methods

- Experimental setup: 3D cylindrical system with 18 cm diameter, 38 cm height, and liquid filled up to 35 cm (Fig.1).
- Bubble generation: air injected vertically through a one-way valve
- Air injection: 700ms wait time, 160ms injection time
- MRI image processing using MATLAB: rotating, brightening, normalizing, and binarizing the images (Fig. 2).

Results

- 0% and 10% sesame seed mixtures showed no visible pattern of bubble formation
- 20% sesame seed mixture displayed a distinct pattern of bubble coalescence consistently every 5th frame as seen in Figure 3.



Conclusion

- MRI imaging and processing revealed a clear coalescence pattern in the 20% sesame seed mixture.
- Future studies: explore additional sesame seed percentages' effects on bubble formation patterns
- Investigate external factors like temperature and pressure variations may enhance the understanding of bubble dynamics in different environments.

niftiread('aaa.nii'); niftiread(('nobubble.nii'); Reads NIfTI files and stores the image data into two variables. Set variables to Create new 3D image, combine regions of interest define regions of from V1 and V2 into V3. interest. imadjustn(I, [0.968 0.996]); I = imgaussfilt(I); = imsharpen (I); Scales the image, convert values Reduces nosie and to double precision, and enhances the definition neutralizes the data for clarity. of edges in an image. VideoWriter('myVideo2.avi'); j=1:N I = imread(['I' num2str(j) '.jpg']); Reads the saved JPEG files (1500 images), resizes each frame, and writes the frames Scan code to view into a video file. video.

Figure 2

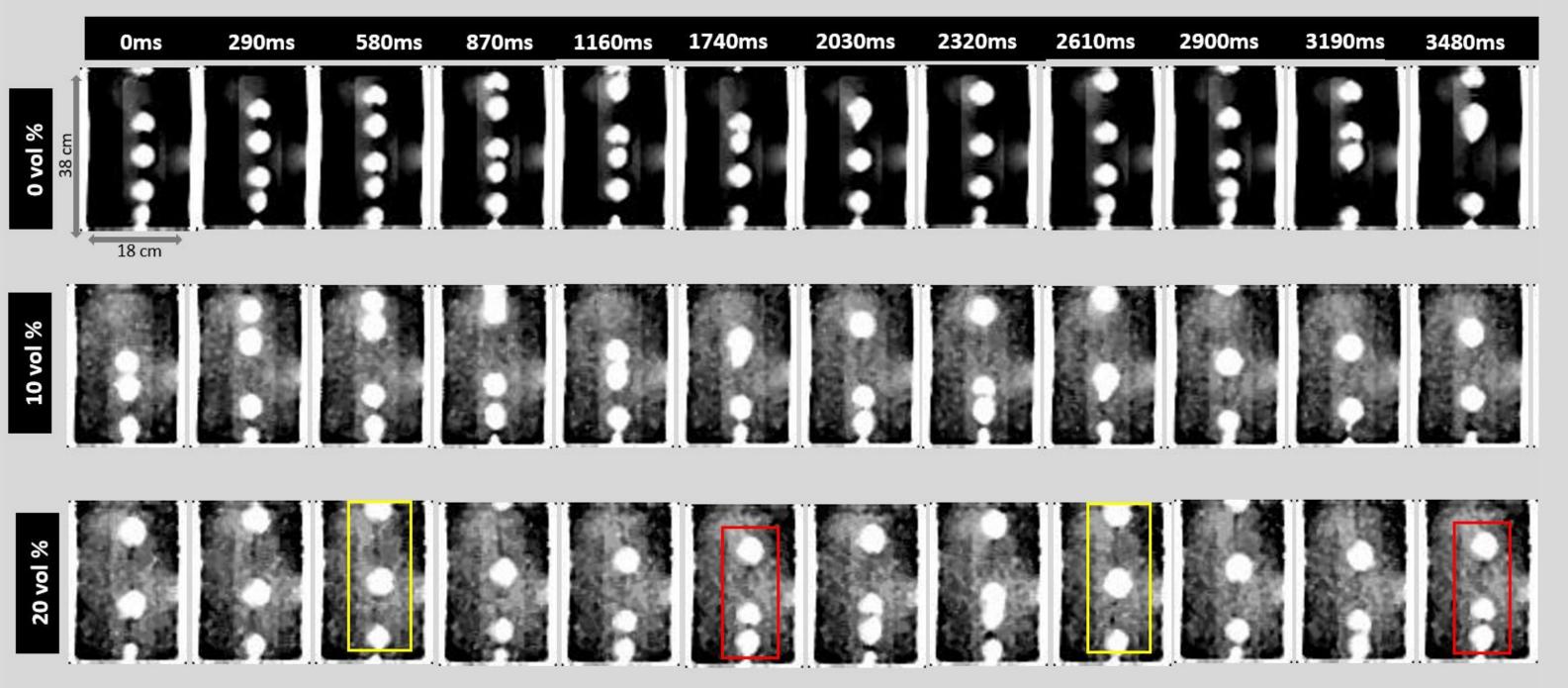


Figure 3

References

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