Title: Protocol for assembling micro- and nanoparticles in a viscous liquid above a vibrating plate

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PII: S2215-0161(18)30150-X
DOI: https://doi.org/10.1016/j.mex.2018.09.008
Reference: MEX 371

To appear in:

Received date: 21-7-2018
Accepted date: 17-9-2018

Please cite this article as: Shabaniverki S, Thorud S, Juárez JJ, Protocol for assembling micro- and nanoparticles in a viscous liquid above a vibrating plate, *MethodsX* (2018), https://doi.org/10.1016/j.mex.2018.09.008

MethodsX article

Title: *Protocol for assembling micro- and nanoparticles in a viscous liquid above a vibrating plate*

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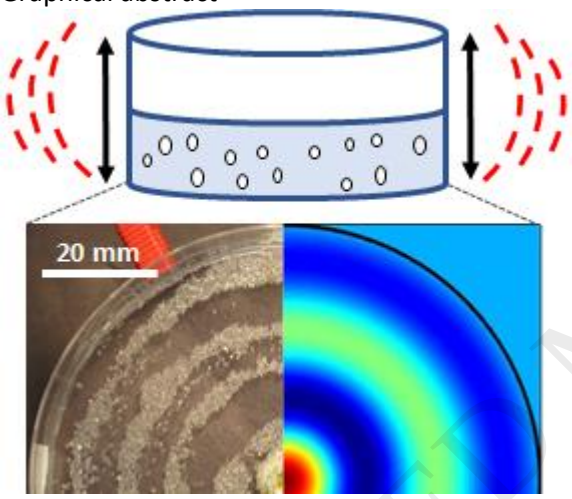
Graphical abstract



Abstract: In this protocol, we demonstrate the use of a vibrating plate to drive the assembly of micro- and nanoparticles as an approach to high-throughput, large-scale directed assembly in a viscous liquid. Vibration drives the assembly of glass bead microparticles and iron oxide nanoparticles in contact with water over an area of 6400 mm^2. We use a scaling analysis to show that there is a competition between acoustic radiation force and vibration-generated fluid flow in a viscous medium, which determines particle transport characteristics. For assembly in a viscous liquid, we find close agreement between the observed experimental results when compared to a numerical solution of the 2D wave equation that describes plate displacement. This model indicates that microparticles migrate along displacement gradients towards displacement anti-nodes where the magnitude of displacement is maximum. We also observe that nanoparticles migrate toward displacement nodes where the magnitude of displacement is zero.

- Cost-effective directed assembly technique without the need for microfabrication facilities
- Large-scale assembly produces heterogeneously ordered structures on a vibrating substrate

Keywords: *Directed assembly; Acoustophoresis; Colloids*