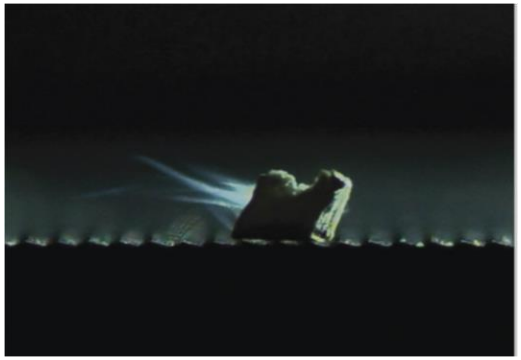
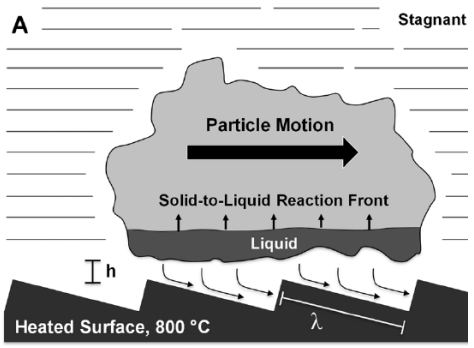
Micro-Ratcheted Surfaces for a Heat Engine Biomass Conveyor

Scientific Achievement

Revealed a novel 'micro-ratcheted' metal surface design via experiment to show that biomass particles will spontaneously propel at reaction conditions in the direction of ratchet orientation



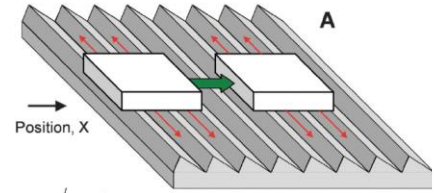


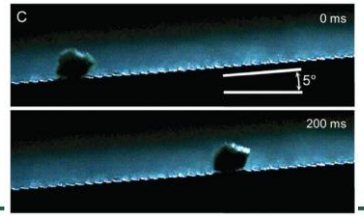
Significance and Impact

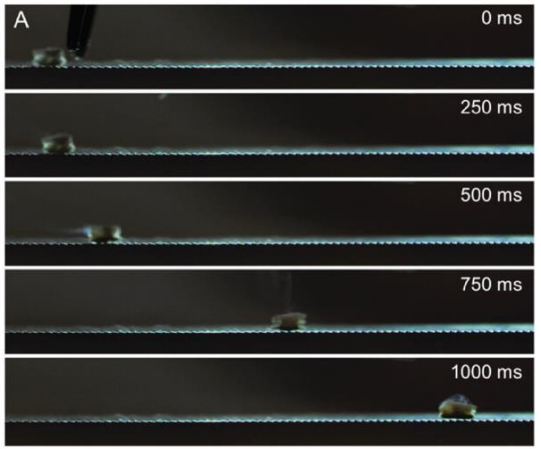
- **Discovery of a surface design to promote particle locomotion will allow for biomass injectors/conveyors with no moving parts within high temperature reactors**

Research Details

- Cellulose particles (1 cm^3) spontaneously move at pyrolysis/gasification temperatures and accelerate with negligible resistance
- Locomotive force is proportional to the force applied to the ratchet surface
- Pyrolysis vapors rectified by the ratchet shear the particle and carry it forward and uphill







Krumm *et al.* **Energy and Environmental Science 2016**, 27(13), 4650, **DOI:** 10.1039/C6EE00519E

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Work was performed at the University of Minnesota by the group of Dauenhauer
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