



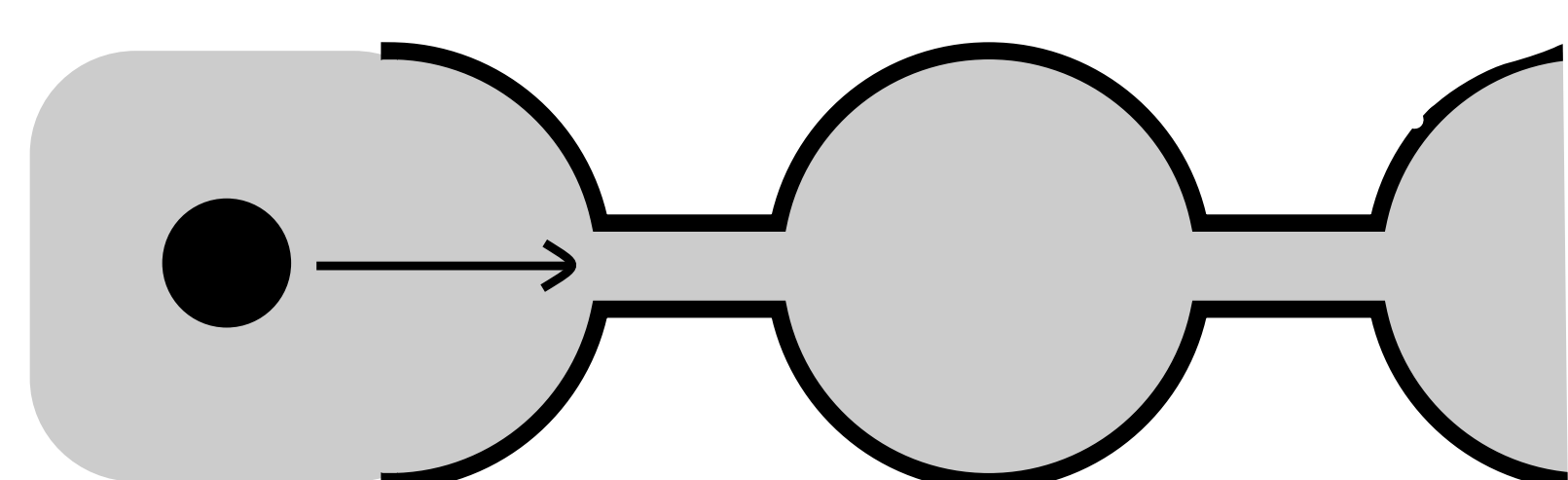
# CLOGGING CASCADE

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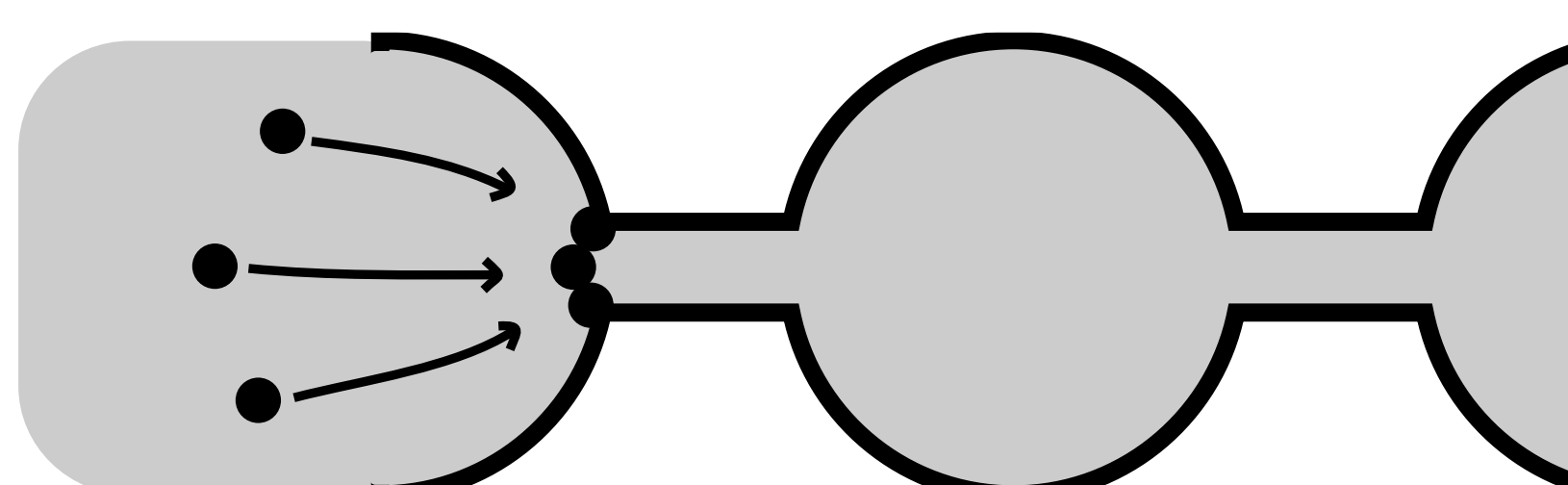
The manipulation and filtration of dilute colloidal suspensions are important processes for both natural and engineered systems. Due to the comparable length scales of the channels and micro-particles, these systems are particularly susceptible to blockage. Clogging is a multi-scale process; the formation of clogs at the pore level eventually results in the blockage of the system. This process is referred to as the clogging cascade.

We study the dynamics of the clogging cascade with an array of parallel microchannels and show, in particular, that the rate of clog formation decreases during the clogging cascade for pressure-driven flow.

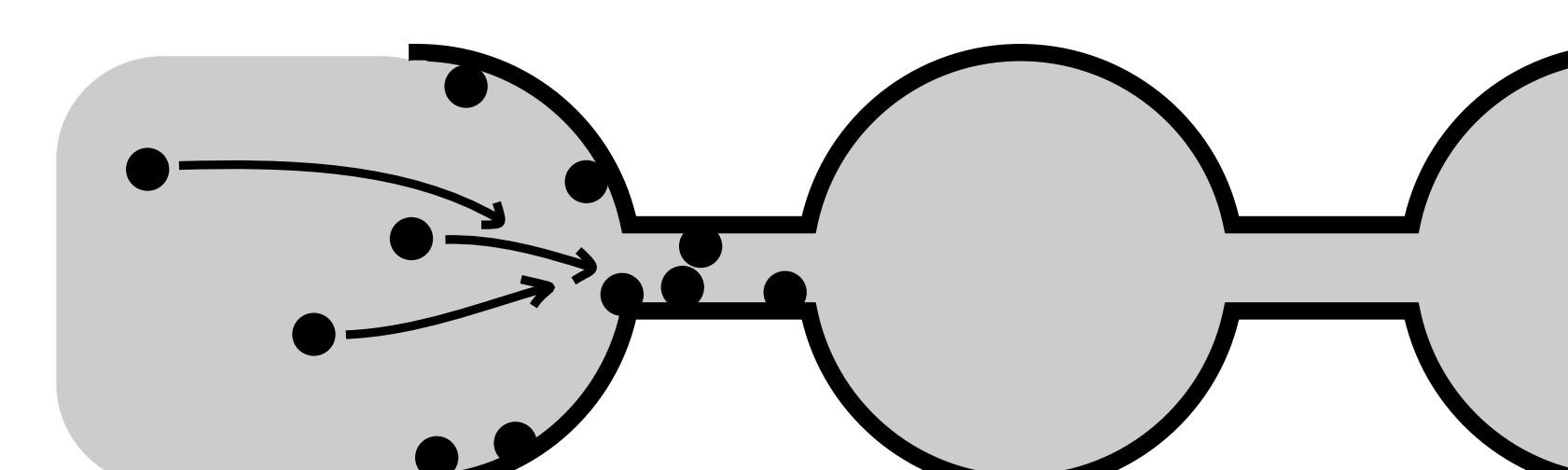
Three physical mechanisms are responsible for the clogging of a microchannel or a porous media:



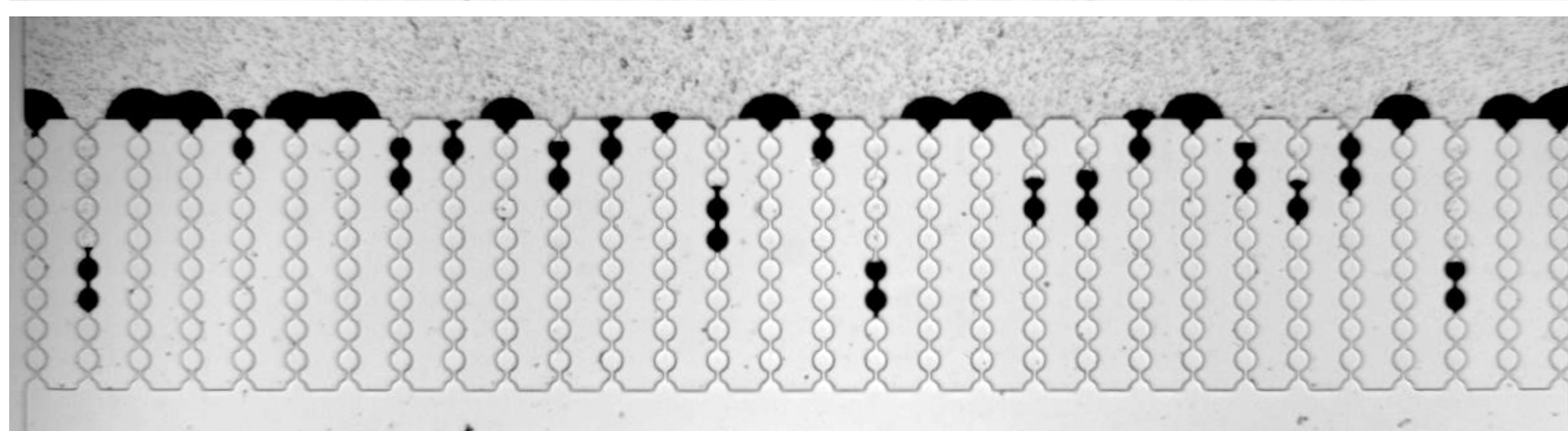
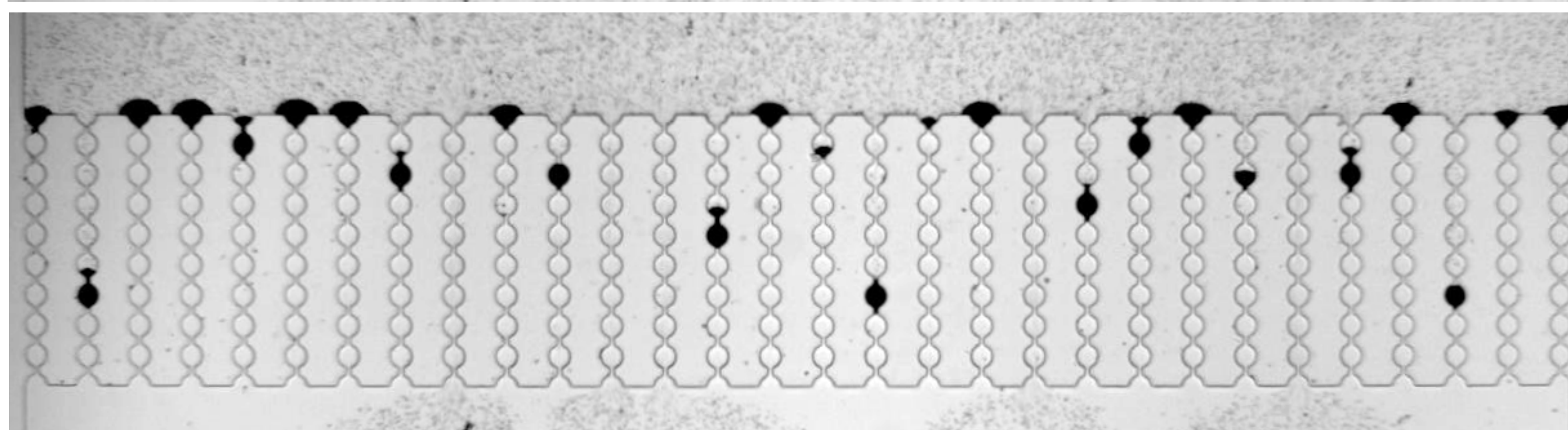
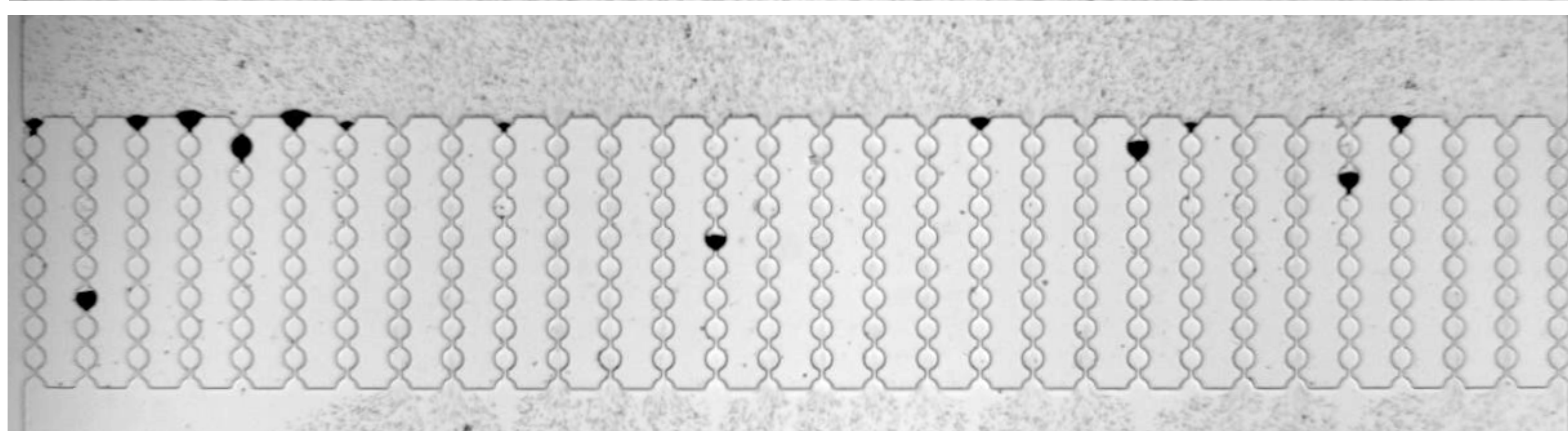
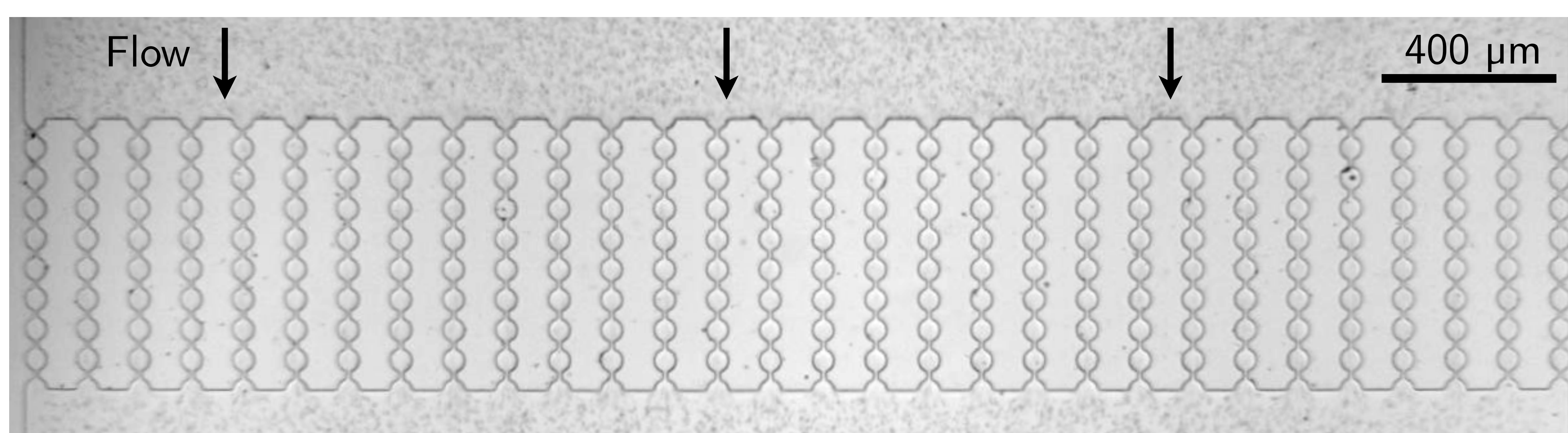
**Sieving:** a particle larger than a pore block the entrance (steric effects)



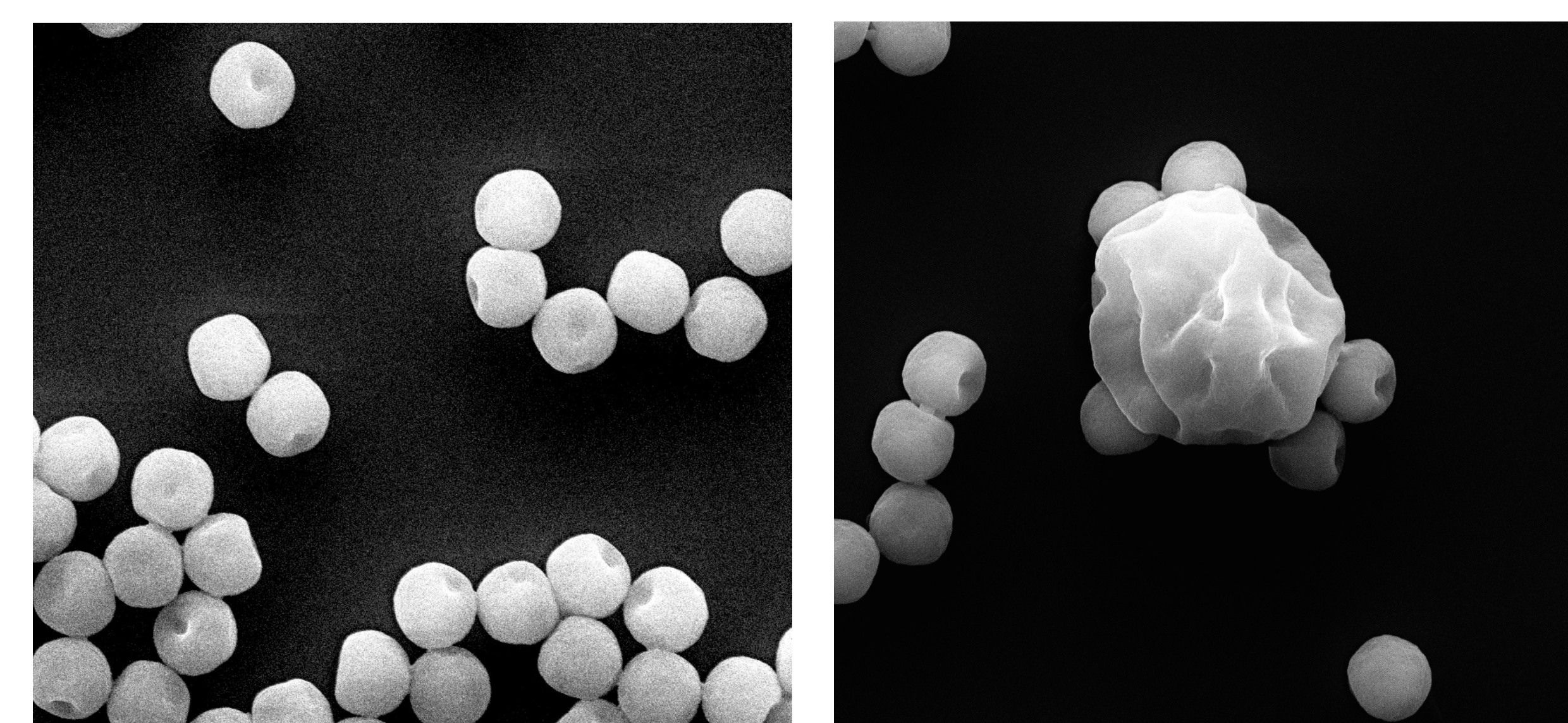
**Jamming:** particles form arches and block the entrance (steric effects)



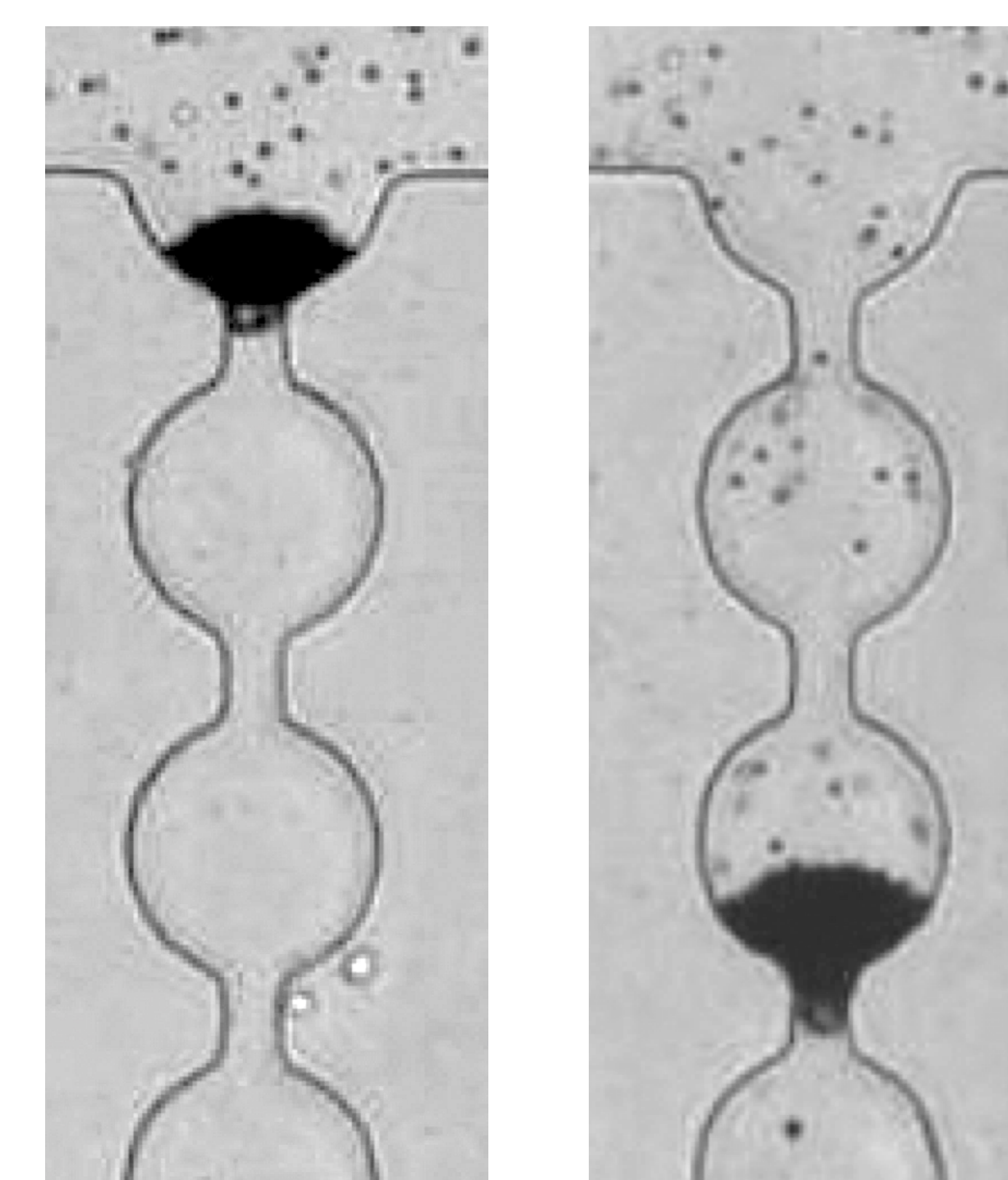
**Deposition:** attractive force such as Van der Waals leads to successive deposition of particles



## Commercial colloidal suspension



Large contaminant generated during the synthesis of the suspension clog microchannels through sieving.



Contaminants can clog the entrance of a channel or reorient and clog deeper into the channel.

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