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Title:	Micro pump Formation Induced by catalytic hydrolysis of phosphodiester Bond
Authors:	Kaundal, Anuj. (/jspui/browse?type=author&value=Kaundal%2C+Anuj.)
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Abstract:	<p>Chemists and engineers have been attempting to miniaturise systems using microfluidics technologies for the past two decades. It has a number of advantages, including portability, high throughput due to parallelization, and a small amount of sample requirement. However, due to the high cost of fabricating a microfluidic chip and the complicated continuous flow control setup needed, this technology has yet to be adopted for large-scale societal applications. In this context, we attempted to develop a tool in which flow is produced within a closed microchamber as a result of specific interactions and catalysis, allowing disease specific biomolecular recognition events to be detected in a much more straightforward and cost-effective manner. Herein we have made a micropump that can perform the catalysis of substrates like HPNPP and BPNPP. HPNPP is an RNA model substrate while BPNPP is DNA model substrate. Using these substrates, we have observed how there is change in flow of tracer particles when these substrates undergo hydrolysis. The substrates HPNPP and BPNPP contain phosphate group in them. Similar to phosphodiester bond cleavage in nucleic acid like DNA and RNA, in these substrates also the phosphodiester bond breaks. For the catalysis of these substrates, different kind of surfactants were synthesised. The head group of the surfactants having metal ion shows better affinity towards phosphates. We have immobilised the surfactant having metal ion in its head group to a glass surface where the silver patch was already formed. The surfactant bonded to silver through metal thiol bonding and the self-assembled monolayer thus formed was used for studying the flow of tracer particles. The flow was affected by the interactions between the self-assembled monolayer and the substrates. This self-assembled monolayer acted as a catalyst for hydrolysing HPNPP into PNP and cyclic phosphate and BPNPP into PNPP and PNP. We also used ATP for studying the multivalent interactions towards the self-assembled monolayer. The catalysis of HPNPP and BPNPP was also monitored using the UV-vis. In future these kind of pumps can be used for DNA and RNA sensing and for diagnosing various diseases using real world samples which can be cost-effective and will require less time.</p>
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