Title:	Regulating Spatial Localization and Reactivity Biasness of DNAzymes by Metal Ions and Oligonucleotides
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Abstract:	Chemical gradient sensing behavior of catalytically active colloids and enzymes is an area of immense interest owing to their importance in understanding fundamental spatiotemporal complexity patterns in living systems and designing dynamic materials. Herein, we have shown the peroxidase activity of DNAzyme (G-quadruplex-hemin complex tagged in a micron-sized glass bead) can be modulated by metal ions and metal ion-binding oligonucleotides. Next we demonstrated both experimentally and theoretically, that the localization and product formation ability of the DNAzyme-containing particle remains biased to the more catalytically active zone where the concentration of metal ion (Hg^{2+}) inhibitor is low. Interestingly, this biased localization can be broken by introduction of Hg^{2+} binding oligonucleotide in the system. Additionally, a macroscopically asymmetric catalytic product distributed zone has been achieved with this process, showing the possibility of regulation in autonomous spatially controlled chemical processes. This demonstration of autonomous modulation of the localization pattern and spatially specific enhanced product forming ability of DNAzymes will further enable the design of responsive nucleic acid-based motile materials and surfaces.
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