Polymeric Microgels as Potential Drug Delivery Vesicles
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Cleveland State University — The temperature dependent volume phase change of
cross-linked amphiphilic molecules (microgels) suggests their use as drug delivery
vesicles. Drug particles aggregate in the slightly hydrophobic microgel interior. They
are stored in equilibrium until the critical temperature (Tv) is reached where the
volume phase change limits available space, thus expelling the drugs. This loading
property of hydroxypropylcellulose (HPC) microgels was tested using amperometric
analytical techniques. Small molecules inside microgels do not approach the elec-
trode surface, which decreases current signal. A room temperature (Troom) flow
amperometric measurement comparing microgel/paracetamol solution with control
paracetamol samples yielded about 20 percent concentration reduction in the mi-
crogel sample. Results from the steady-state electrochemical experiment confirm
the 20 percent concentration drop in the microgel sample compared to the control
sample at Troom. Using the steady-state experiment with a cyclic temperature
ramp from Troom to beyond Tv showed that the paracetamol concentration change
between the temperature extremes was greater for the microgels than for the con-
trols. An evolving aspect of the study is the characterization of microgel shrinkage
from in situ, temperature controlled liquid AFM images as compared to previously
completed DLS characterization of the same microgel sample.

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