Adaptable and Smart Amphiphilic Systems in Enhanced Oil Recovery

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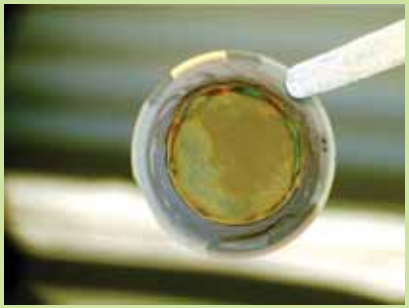
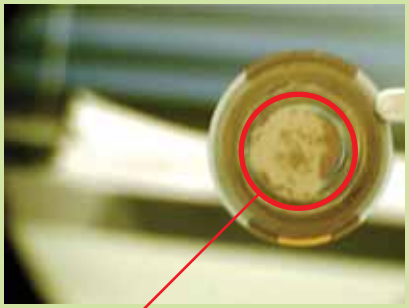
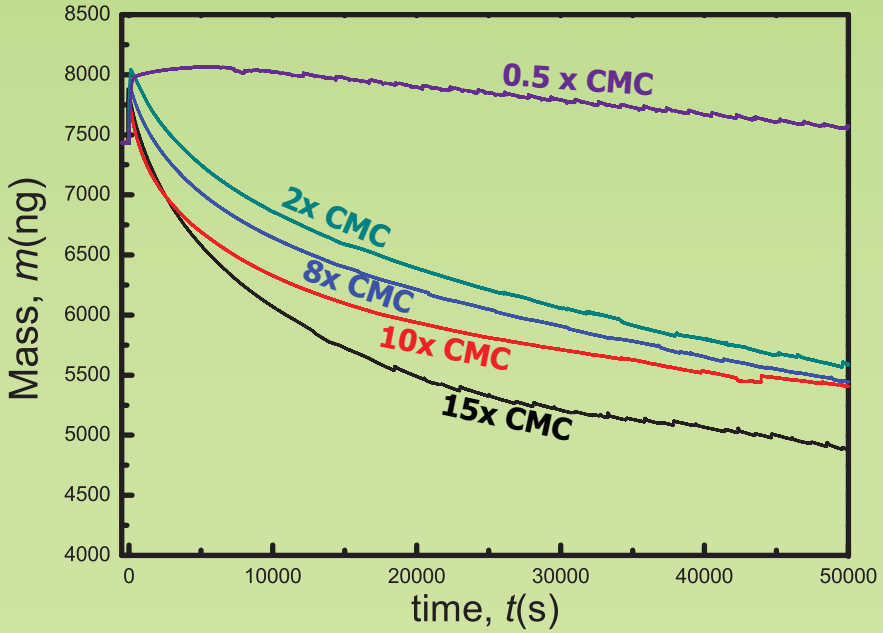
Bare SiO_2 Sensor

Asphalt Coated Sensor

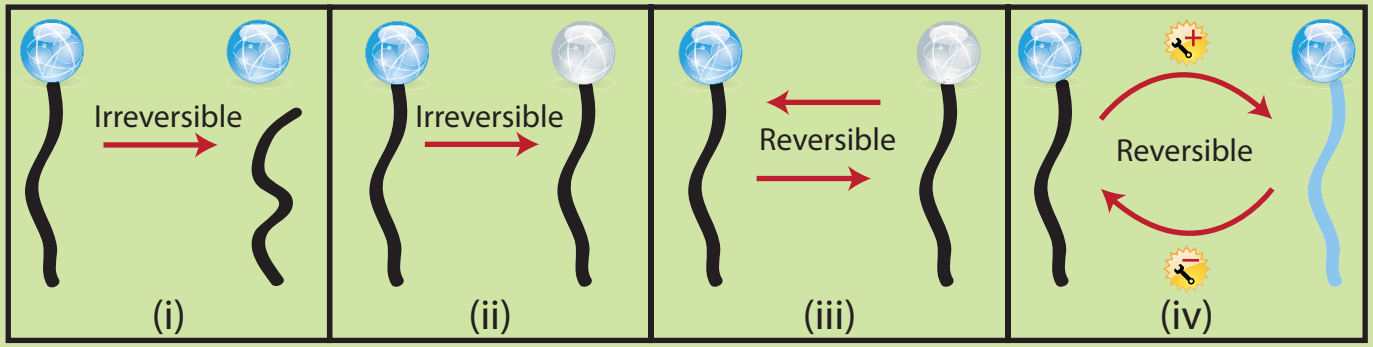


Sensor after surfactant treatment





We have demonstrated the use of quartz crystal microbalance (QCM) to measure nanoscale dynamics of an oil (asphaltene) recovery process relying on an amphiphilic solution (4-Nonylphenyl-polyethylene glycol). As consistent with bulk scale studies, the rate of recovery was larger at higher CMC values and the recovery was inefficient below the CMC value. The analysis of the effulent via dynamic light scattering (DLS) revealed that the effulent contains emulsions ranging from 500 nm to 2 μm.



In future studies, we seek obtain a better understanding of how dynamics of assembly/disassembly and adsorption/desorption processes of newly developed adaptable and smart amphiphiles depend on specific amphiphilic properties, such as absolute and relative sizes of hydrophobic and hydrophilic groups, and molecular structure (branching, linearity, and aromaticity) and modes of activation such as temperature, and pH.