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Designing spherical patchy particles for optimum surface activity at liquid-fluid interfaces HOSSEIN REZVANTALAB, ALI HASHEMI, SHAHAB SHOJAEI-ZADEH, Rutgers, The State University of New Jersey — Adsorption of spherical patchy particles to a flat liquid-fluid interface is investigated. Chemical heterogeneity in form of patches with different number and size can be introduced on the surface of a homogeneous particle to induce an amphiphilic character. Compared to homogeneous particles, amphiphilic particles show stronger adhesion to the interface and thus can be used as effective interface stabilizers. Using the concept of detachment energy for a particle at an interface, we analytically developed a criterion to design single-patch particles with maximum surface activity. The method is then extended to include particles with two symmetric patches. The energy landscapes reveal the existence of two local minima for such double-patch particles when the patches are oriented either parallel or normal to the interface. We evaluate the effectiveness of introducing the second patch on the particle as a function of its size and wettability. Addition of a second symmetric patch can enhance the surface activity, compared to a single – patch particle, provided that the patch groups are relatively small, each with close affinity to the fluid phases. On the other hand, single-patch particles are more surface active for highly amphiphilic cases.

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