

Vesicles in contact with multiple aqueous phases

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We study novel soft matter systems consisting of lipid vesicles and phase separating polymer solutions. Our theoretical analysis suggests the existence of an intrinsic contact angle between the membranes and the aqueous phases, reminiscent to Young's angle in standard wetting phenomena. An explicit relation is derived by which the intrinsic angle can be determined from experimental observables. The theory is then used to describe (i) the budding transition, where one of the aqueous phases protrudes from the vesicle body to minimize the interfacial energy between the aqueous phases; (ii) the formation of membrane nanotubes in these systems; and (iii) the competition between these two modes of spending excess membrane area (i.e. budding transition vs. tubular membrane formation).