Foam Stabilisation Using Shape-Anisotropic Materials

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We have prepared super-stable foams, comprised by air bubbles stabilized by rigid $CaCO_3$ rods modified by essential fatty acids. The SEM images the rod stabilized bubbles revealed unique bubble size dependent surface structure evolution: at small bubbles surface, the rods overlap randomly and assemble into a nest-like structure, where part of the rods stick out into the continuous phase, while the armour-like structure of large bubbles is composed form smectic crystalline domains made of rods. Furthermore we also look at generation of hieratical structures of rod stabilised bubbles. This is possible due to very high bubble stability and stiffness, which retain their spherical shape when dried on glass substrates and could be ordered into 2D binary colloidal crystals, with big bubbles at the bottom and small bubbles in between. When looked from bottom up perspective, these 2D bubble crystals represent a remarkable self assembly hierarchy, spanning over more then 7 orders of length scales magnitudes. Similarly to the lotus leaf our 2D bubble crystals have inherited roughness on nano and micron level and could be used for preparation of novel super-water repellent surfaces. The bubbles in bulk 3D foams could be “glued” together and dried, which in turn could be used as novel materials or material templates. On practical site the methods we used to generate these structures are simple, scalable and are based on sustainable materials. All the process and materials can be food grade, allowing development of novel food systems, where one and the same material could be used for structuring (delivering super stable aerated food products) and deliver health and nutrition in the same time when digested as the rods will dissolve in low pH of the gut and will release important nutrients and health actives like Ca and essential fatty acids.

Reference:

[1] *Angew. Chem. Int. Ed.*, 48, 378 –381, **2009**