Comparative studies of reversible aggregation of X-, T-, and anchor-shaped bolaamphiphiles in monolayers at the air/water interface

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We present the results for new compounds from the group of specific surfactants known as bolaamphiphiles. The partially fluorinated bolaamphiphiles exhibit an unusual reversibility of Langmuir isotherms even though compressed at maximum rate of compression up to a total collapse of the film. Aggregation in Langmuir films is usually meant as a disorderly grouping of the molecules into the chaotic three dimensional aggregates and is considered as unwanted phenomenon causing irreversible changes. The key property of these compounds is partial fluorination of the lateral chains linked to the rigid cores of the molecules. The molecules of different shape (X-, T-, and anchor shaped) are studied. The most interesting feature of the compounds is that depending on shape and degree of fluorination they are able to resist aggregation remaining as a monolayer until relatively high surface pressures (T-shaped molecules), or create bilayers (X-shaped molecules) and trilayers (anchor-shaped molecules).

Sketch showing compression/decompression of monolayer and perfectly reversible process in spite of the compression to complete collapse of the film.