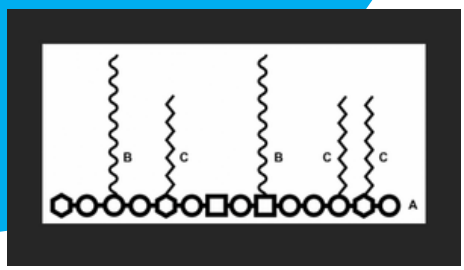
Multifunctional and Universally Applicable "Intelligent" Surfactants

TLB
Technologie-Lizenz-Büro
der Baden-Württembergischen Hochschulen GmbH

Biodegradable, surface-active surfactants for compatibilizing more than two phases

- Compatibility of more than two phases in particular
- Can be designed to be biodegradable
- No formulation/individual optimization required (universally applicable)
- No mixtures of surfactants required
- Polyelectrolyte character (charge) of the main chain is variable
- Type and number of side chains and thus functionality can be varied
- Comparatively simple synthesis
- No auxiliaries required



Fields of Application

Suitable for universal use and for a variety of different dispersing tasks in household and industry: detergents, dishwashing detergents, cosmetics, shampoos, crop protection, plastics industry, paint industry, food industry, industrial cleaning, personal care industry, soap industry, textile industry, etc.

Contact
Dr. Frank Schlotter
TLB GmbH
Ettlinger Straße 25
76137 Karlsruhe | Germany
Phone +49 721-79004-0
schlotter@tlb.de | www.tlb.de

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Patent Situation
DE 102021114054 pending
EP 22 732 060.3 (EU unitary patent) pending

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21/024TLB

Service
Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Background

Surface-active substances, i.e. surfactants, are washing-active substances ("detergents") that can form foam, facilitate the removal of dirt and enable water and oil to mix. Surfactants are therefore found in really every household, but also have numerous industrial applications.

The total global surfactants market size was approximately $44 billion in 2019 and is expected to reach approximately $60 billion by 2025, growing at a CAGR of approximately 5%.

Problem

Common surfactants usually consist of a polar and a non-polar structural unit. For more demanding tasks, such as the stabilization of charged particles, e.g. mineral nanoparticles, in an aqueous and organic medium, mixtures of surfactants have so far been required to exhibit the required solution properties in combination. Such mixtures have to be formulated in a technically complex way for each specific application. This is a considerable development effort with correspondingly high development and production costs. Due to the often different storage requirements of the respective surfactants in such mixtures, their logistics are demanding. In addition, undesirable interactions between the different surfactants are possible.

Solution

The multifunctional "smart" surfactants are comb polymers, which have at least three structural units that can be varied. The polyelectrolyte main chain A forms the backbone of the comb polymer and has at least partially charged structural units. Due to the corresponding charges of the polyelectrolyte chain, charged particles such as mineral nanoparticles can be bound. Different side chains on the polymer backbone add further functions (e.g. polar, non-polar, fluorophilic, complexing, etc.) and allow to stabilize a variety of different phases. This structure gives the comb polymer the ability to combine different functions in one molecule, to recognize the chemical environment and to fold in such a way that the corresponding structural units of the comb polymer dissolve in the respective phases and combine with them. This "intelligent" behavior allows broad use in a wide variety of systems without requiring individual optimization of the surfactant or even a surfactant mixture.

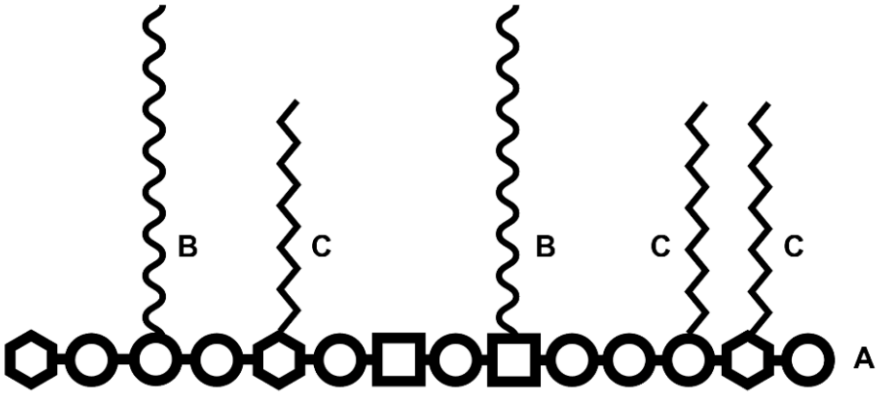

Fig.: Main chain A with electrolyte and non-electrolyte units as well as the functional side chains B and C, further side chains D, F etc. possible [H. Cölfen, Department of Chemistry, University of Konstanz]