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Data Article

Water capacity and size data of reverse micelles formed by novel cationic surfactants

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A R T I C L E I N F O

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A B S T R A C T

This paper contains data of water capacity (in terms of w_0 = mol$_{\text{water}}$/mol$_{\text{surfactant}}$) in reverse micelles formed by several commercial and non-commercial cationic surfactants in cyclopentane, petroleum ether, and iso-octane. Also reported are hydrodynamic diameters of the respective reverse micelles formed. Tested surfactants were (i) single-chained cationics: cetyl benzyl diethanolammonium bromide (CBDB), cetyl benzyl dimethylammonium bromide (CBMB), cetyl dibutyl ethanolammonium bromide (CDBEB), cetyl cyclohexyl dimethylammonium bromide (CCDB); and (ii) twin-chained cationics: didodecyl dimethylammonium chloride (DDMC), didodecyl diethylammonium bromide (DDEB), didodecyl dipropylammonium bromide (DDPB), didodecyl diethylammonium chloride (DDEC), dodecyl benzyl dimethylammonium bromide (DBDMB). Also reported are sizes of reverse micelles as determined by dynamic light scattering.

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Specifications Table

Subject area	*Chemistry*
More specific subject area	*Colloid chemistry*
Type of data	*Tables and graphs*
How data was acquired	*Dynamic light scattering device (Nicomp Model 370 computing autocorrelator (PSS, Santa Barbara, USA))*
Data format	*Intensity autocorrelation function analysed by a cumulants approach. Diameters obtained with the Stokes-Einstein relation.*
Experimental factors	*Hydrodynamic diameters in nanometres (nm)*
Experimental features	*Water capacity of reverse micelles in organic solvents was determined visually, and micellar sizes determined by dynamic light scattering*
Data source location	*Chieti, Italy*
Data accessibility	*Data is within this article*
Related research article	*Di Profio P, Canale V, Germani R, et al. Reverse micelles enhance the formation of clathrate hydrates of hydrogen. J. Coll. Int. Sci. (2018) 516, pp. 224–231 [1].*

Value of the data

- Reported data usefully show unexplored surfactant families forming reverse micelles in organic solvents with moderate to high values of w_0.
- Cationic surfactants tested may be a valuable alternative to the usual anionic, AOT-based surfactants in the formation of reverse micelles.
- Present data may be useful in the field of enzyme formulations, in particular for biotechnological applications.
- Water capacity and size data may be the starting point for further characterizations of rheological properties.

1. Data

Data presented in this report are: (i) values of maximum water content of reverse micelles in cyclopentane, petroleum ether, and iso-octane; and (ii) values of hydrodynamic diameters (nm) of the respective reverse micelles. Data referred to in (i) and (ii) are reported in Table 1, Fig. 1, and in Supplementary materials.

Table 1
Values of water uptake in reverse micelles (w_0 = mol water/mol surfactant), and their hydrodynamic diameters (nm).

	w_0	Hydrodynamic diameter (nm)
Surfactant, 0.1 M in cyclopentane		
Cetyl benzyl diethanolammonium Br	49	6.7
Cetyl benzyl diethanolammonium Br	56	5.4
Cetyl benzyl dimethylammonium Br	42	20.4
Cetyl benzyl dimethylammonium Br	49	6.2
Cetyl benzyl dimethylammonium Br	45	6.4
Cetyl benzyl dimethylammonium Br	52	11.1
Cetyl benzyl dimethylammonium Br	59	10.0
Cetyl dibutylethanolammonium Br	42	3.5
Cetyl dibutylethanolammonium Br	49	10.3
Cetyl dibutylethanolammonium Br	56	2.9
Didodecyldiethylammonium Cl	35	4.6
Didodecyldiethylammonium Cl	52	5.8
Surfactant, 0.1M in petroleum ether		
Cetyl dibutylethanolammonium Br	42	5.6
Cetyl dibutylethanolammonium Br	49	4.6
Cetyl dibutylethanolammonium Br	59	7.6

Table 1 (*continued*)

	w_0	Hydrodynamic diameter (nm)
Cetyl cyclohexyldimethylammonium Br	35	7.5
Cetyl cyclohexyldimethylammonium Br	52	10.0
Didodecyldimethylammonium Cl	56	5.3
Didodecyldimethylammonium Cl	35	5.3
Didodecyldiethylammonium Br	34	6.3
Didodecyldiethylammonium Br	52	6.8
Didodecyldipropylammonium Br	35	13.0
Didodecyldipropylammonium Br	52	14.1
Dodecylbenzyl dimethylammonium Br	36	12.4
Dodecylbenzyl dimethylammonium Br	53	11.6
Surfactant, 0.1M in iso-octane		
Didodecyldimethylammonium Cl	51	4.0
Didodecyldiethylammonium Br	37	6.8
Didodecyldiethylammonium Br	54	4.7
Didodecyldipropylammonium Br	34	5.1

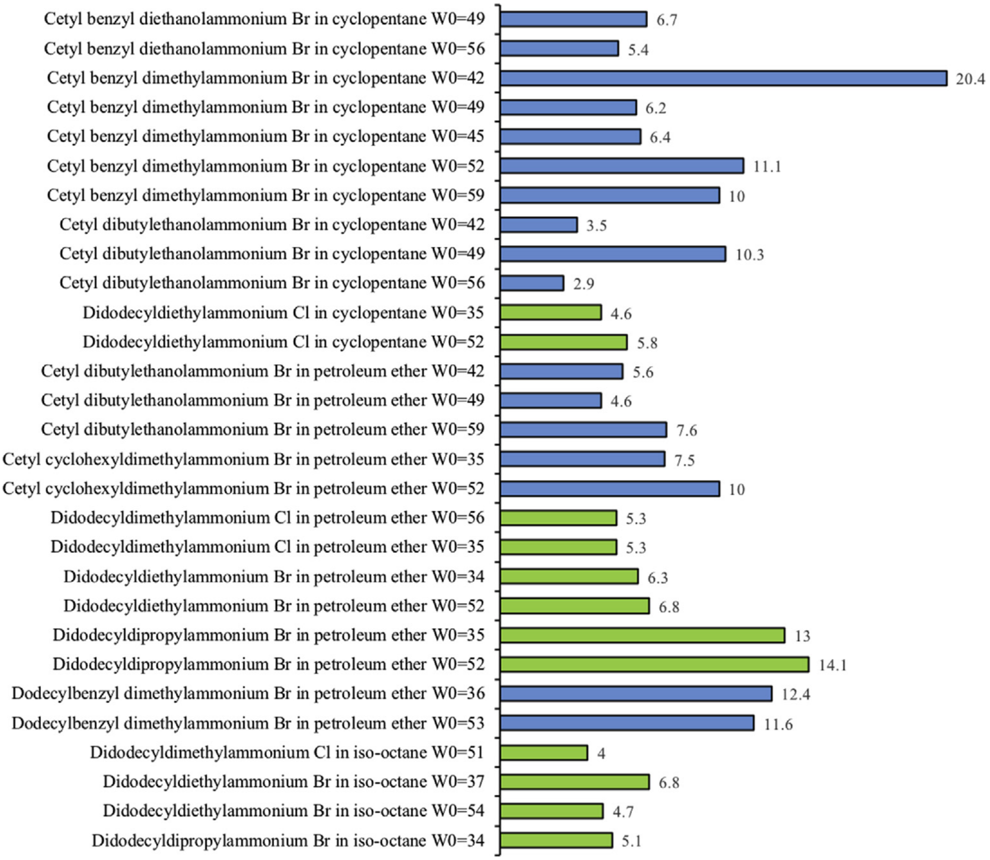

Fig. 1. Hydrodynamic diameters of reverse micelles for listed single- (green bars) and twin-chained (cyan) cationic surfactants at the highest water contents.

2. Experimental design, materials, and methods

Surfactants were (i) single-chained cationics: cetyl benzyl diethanolammonium bromide (CBDB), cetyl benzyl dimethylammonium bromide (CBMB), cetyl dibutyl ethanolammonium bromide (CDBEB), cetyl cyclohexyl dimethylammonium bromide (CCDB), which were synthesized as described in literature [2], except for CBMB which was purchased from Sigma-Aldrich; and (ii) twin-chained cationics: didodecyl dimethylammonium chloride (DDMC), didodecyl diethylammonium bromide (DDEB), didodecyl dipropylammonium bromide (DDPB), didodecyl diethylammonium chloride (DDEC), dodecyl benzyl dimethylammonium bromide (DBDMB), which were synthesized as described in literature [3–5], except for DBDMB, which was purchased from Sigma-Aldrich.

2.1. *Preparation of solutions for determination of* w_0

All experiments were carried out at 20 °C. Surfactants were dissolved at 0.1 M concentration in organic solvent; then 10 μL of 0.2μm-filtered, MilliQ water was added by a Hamilton syringe, and the solution was briefly sonicated in a Branson 220 bath sonicator until visually clear. Then the solution was left standing for 15 minutes to check its stability. If the solution remained visually clear, another 10-μL of water were added, and the process repeated up to a point where the solution started to show a faint turbidity after standing. Table 1 reports w_0 data relating to the highest water amount which yielded a clear solution.

2.2. *Preparation of solutions for dynamic light scattering measurements*

Solutions were prepared as above, except that addition of water did not exceeded the coalescence limit, as determined. Further, water and organic solvents were centrifuged at 10000 rpm for 15 min before starting the experiment. Light scattering was performed at 20.0 °C with an argon laser source (Coherent Innova 70-3) emitting at 4880 Å. A 64-channel Nicomp Model 370 computing autocorrelator (PSS, Santa Barbara, USA) was used to calculate the diffusion coefficient, *D*, and hydrodynamic diameters. Values of coefficients of variation were 20–40%.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.104424.

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