

LIFE IN HYDROCARBONS: MEMBRANES AND VESICLES IN NON-AQUEOUS SYSTEMS

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1 The idea

Start

Is there life on ... Titan?

Lary H. Nicolson and a Cosmic Perspective: The possibilities for life on and in Saturn's complex hydrocarbon system of Titan.

The Limits of Organic Life in Planetary Systems

Contributed by the Division of Planetary Sciences, California Institute of Technology

2 Why not?

Why not consider the possibility of constructing membranes able to assemble in apolar systems such as an hydrocarbon system?

Target

LIPOPHOBIC TAILS LIPOPHILIC HEADS

We need reverse amphiphilic molecules with a lipophilic head and one or two lipophobic tails

3 Proposed reverse amphiphiles

Lipophilic head

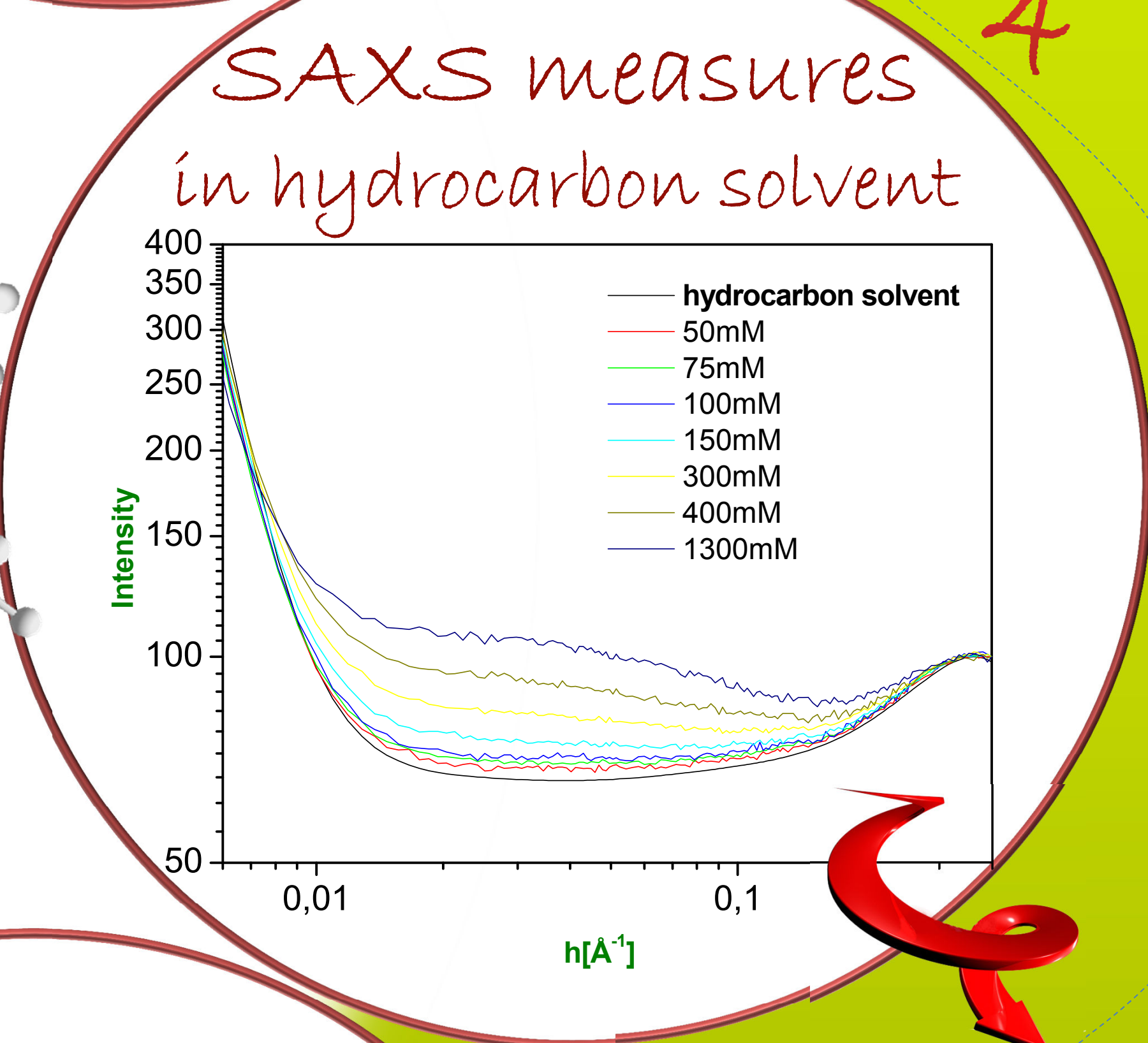
PEG TAIL

synthesized with high purity (>98%)

FINAL TARGET

vesicle micelle double layer

LIPOPHOBIC LIPOPHILIC



7 Next steps

- use of fluorophores, SAXS, and SANS to confirm the formation of double layer vesicles
- Dependence of critical aggregation concentration on temperature (Sydney) and concentration.

5 SAXS measures: Guinier plot

the number of aggregates grow with the increasing of the surfactant concentration

Concentration	R_g
50 mM	1.1 nm
75 mM	1.2 nm
100 mM	1.3 nm
150 mM	1.5 nm
300 mM	1.5 nm
400 mM	1.5 nm
1300 mM	1.4 nm

HYPOTHESIS: formation of micelles ($R_g \approx 1,5nm$)

6 Ongoing syntheses: double tail amphiphiles

Lipophilic head

2 PEG TAILS



REFERENCES:

- Norman, L. H., *Astronomy & Geophysics* 2011, 52, 1.39-31.42
- Schulze-Makuch, D., et al. *Microbial life in a liquid asphalt desert.* *Astrobiology* 3: 241-258. (2011)
- The limits of organic life in planetary systems, the National Academy Press.

