Berkeley, 24th March 2017

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

DIBMA: A Non-Aromatic Polymer for Solubilising Membrane Proteins

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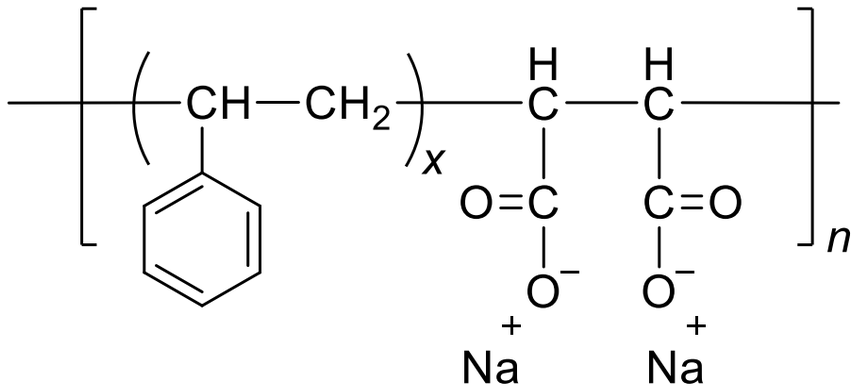
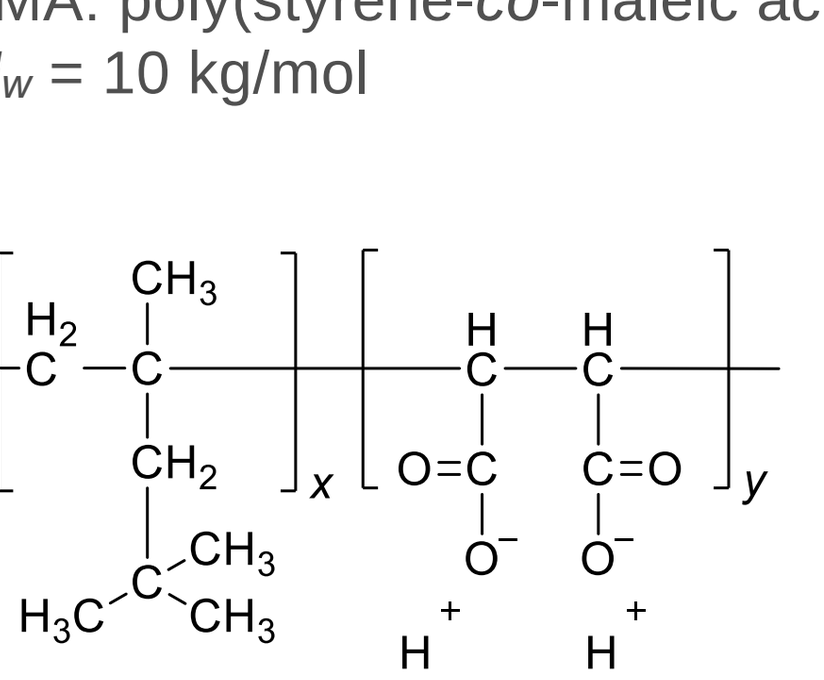
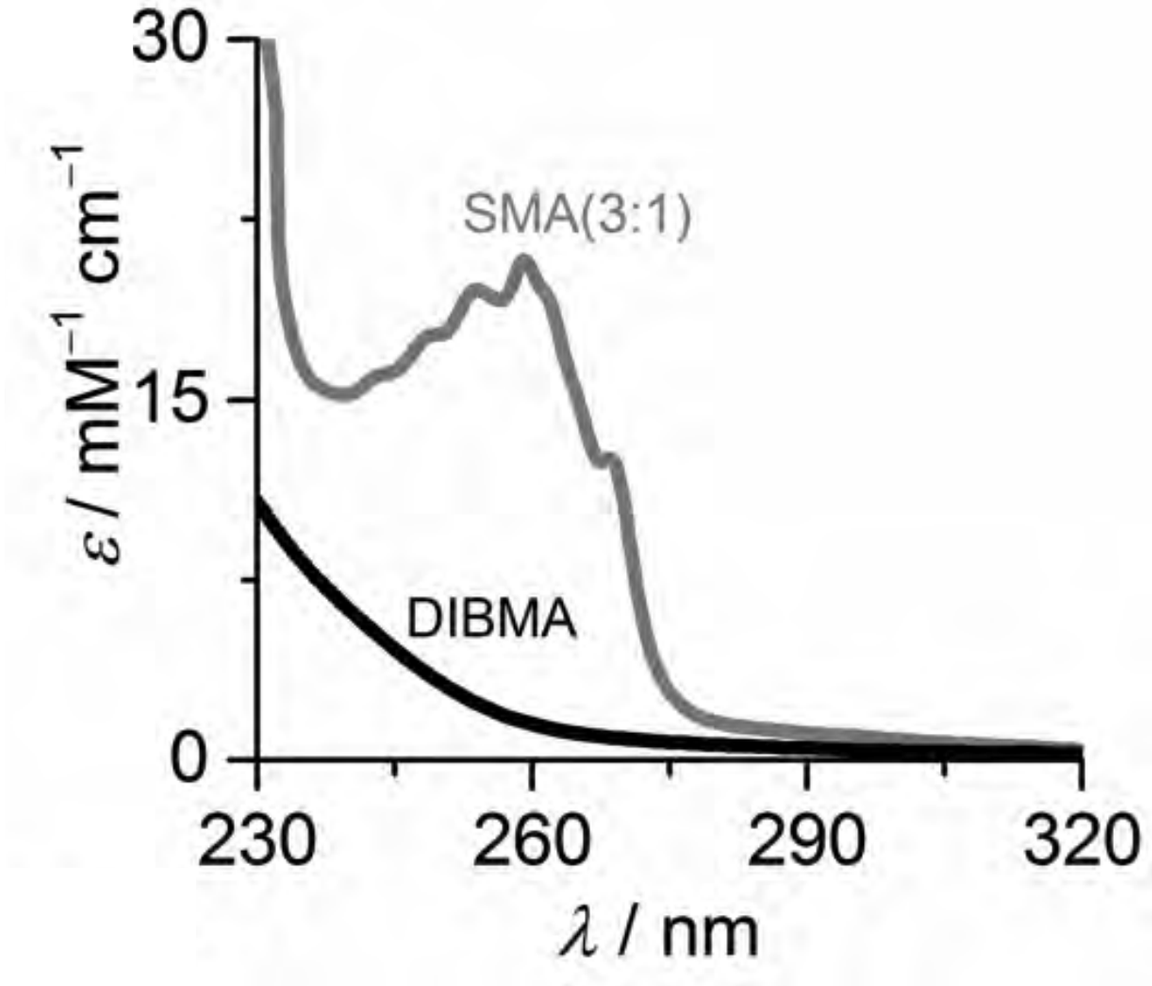
Aromatic vs. aliphatic copolymers



SMA: poly(styrene-*co*-maleic acid)
M_w = 10 kg/mol

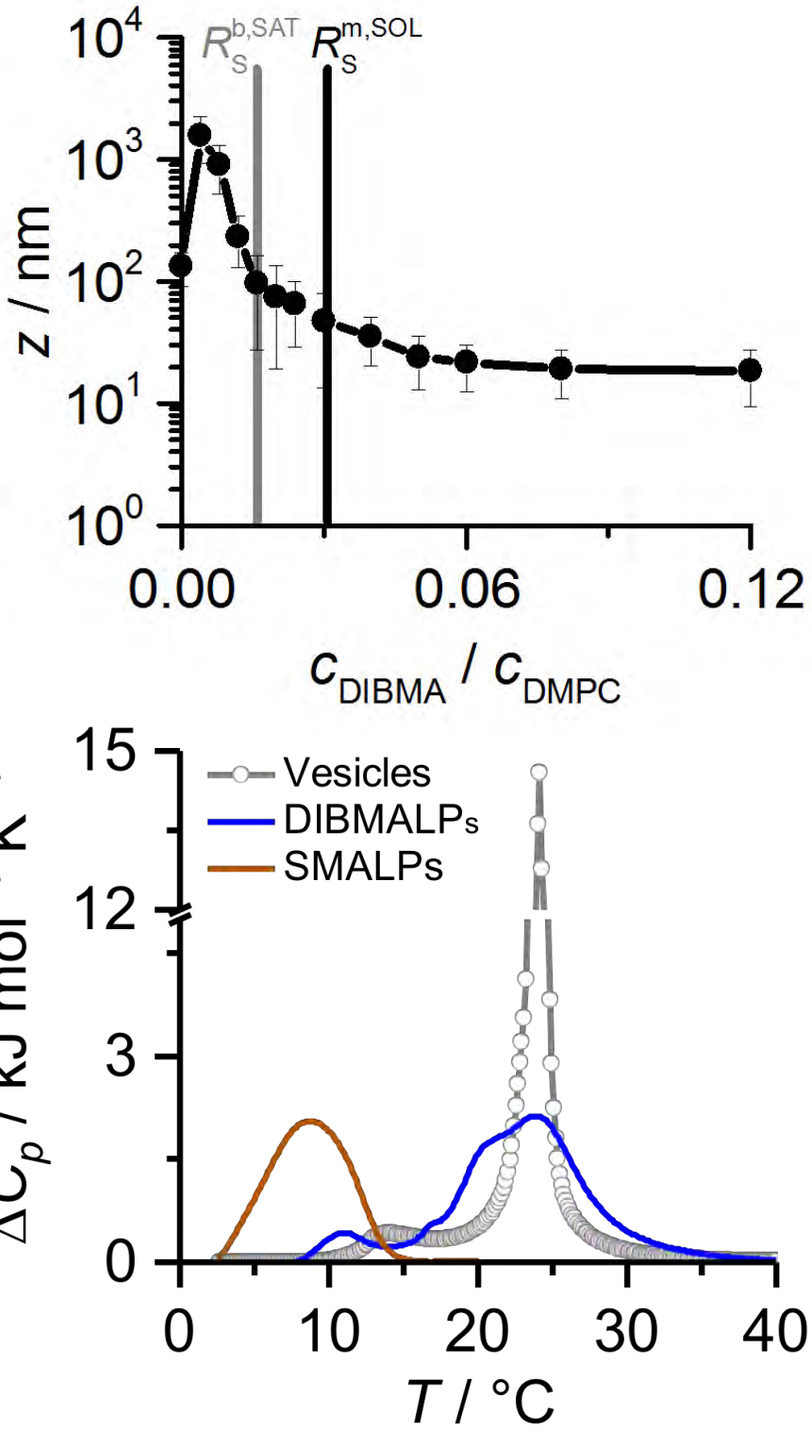


DIBMA: poly(diisobutylene-*alt*-maleic acid)
M_w = 12 kg/mol

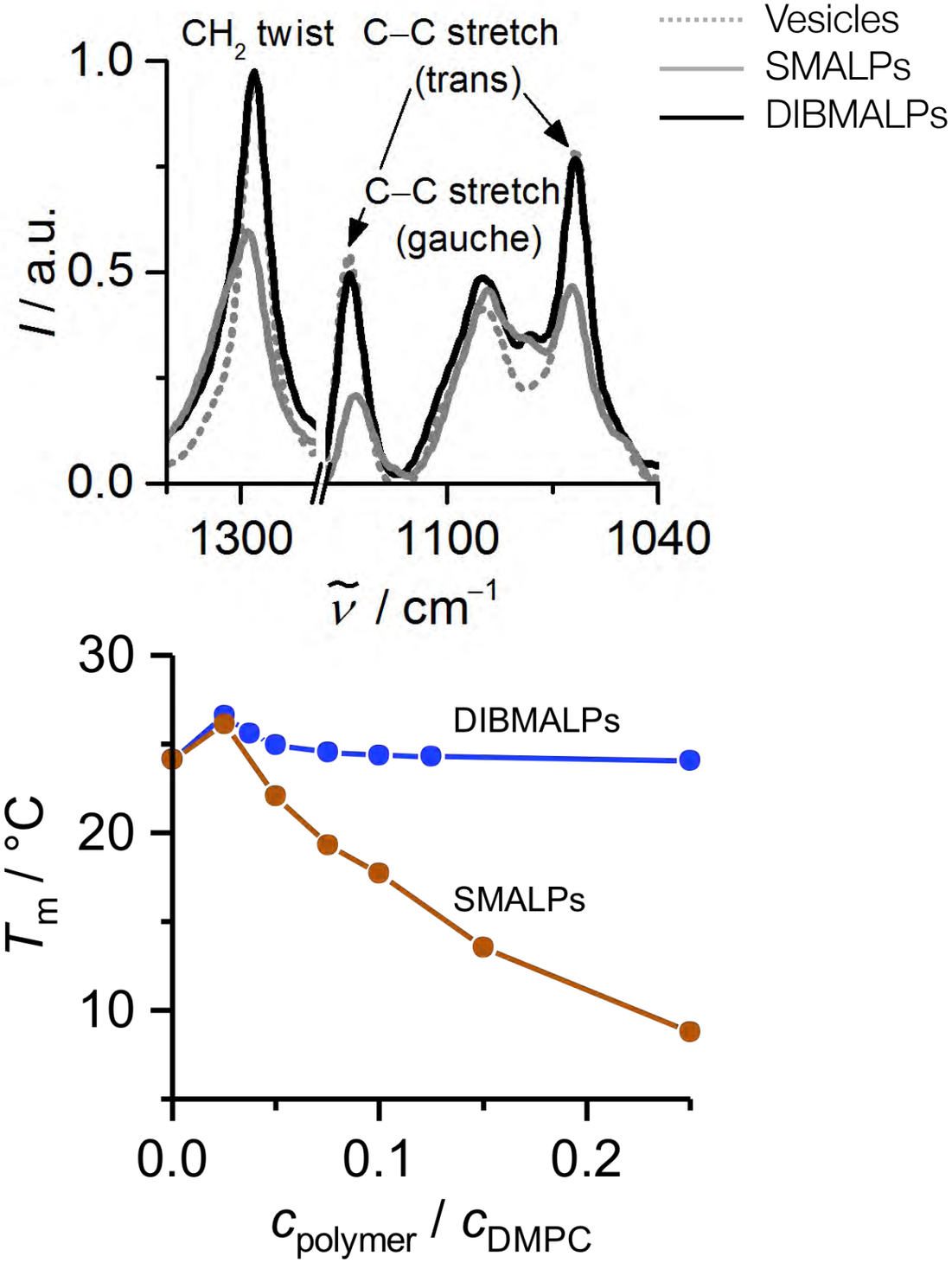


Oluwole et al. *Angew. Chem. Int. Ed.* **2017**, *56*, 1919

Mild effects on membrane lipid order



d = (20–25) nm



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Compatibility with divalent cations

$c_{Ca^{2+}}$ / mM

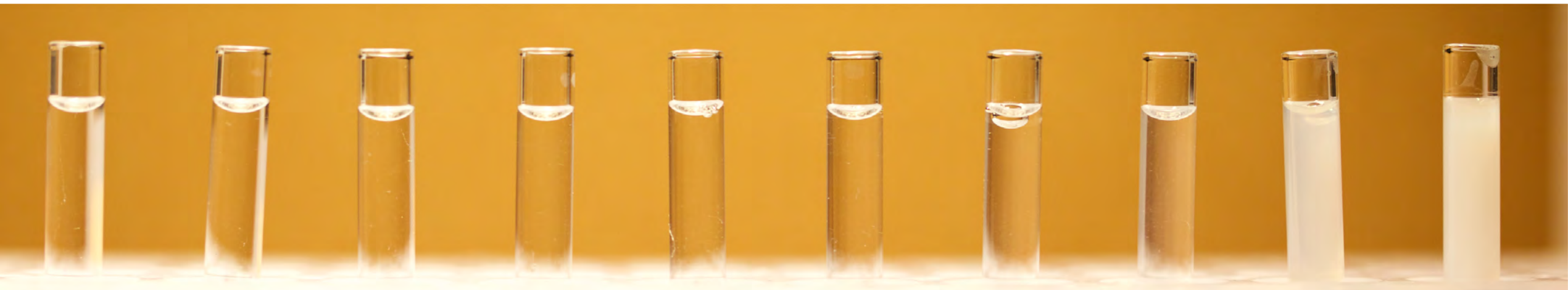
0 1 2 3 4 5

SMALPs

$c_{Ca^{2+}}$ / mM

DIBMALPs

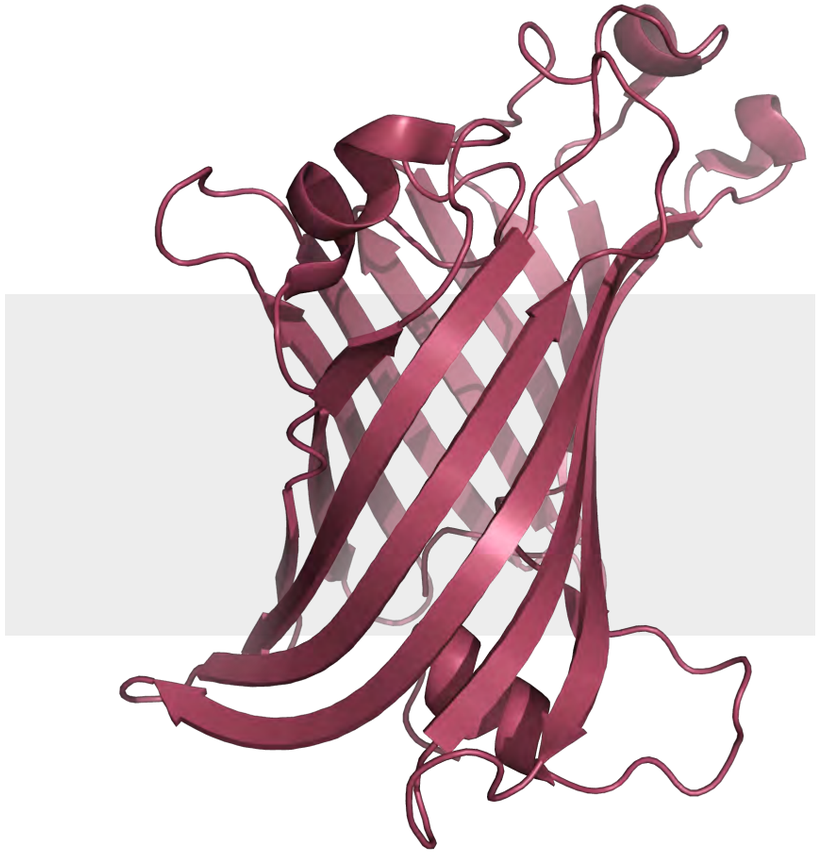
0 5 10 15 20 25 30 35 40 50

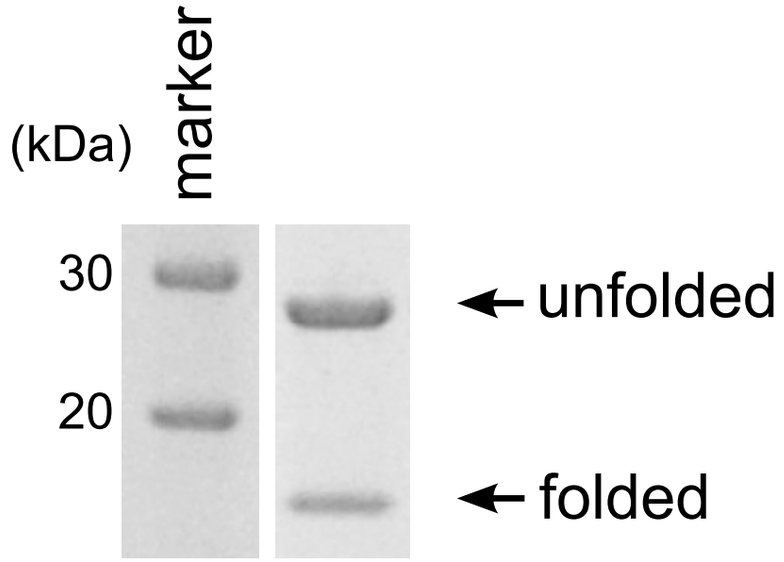


Model protein

Outer membrane phospholipase A (OmpLA):

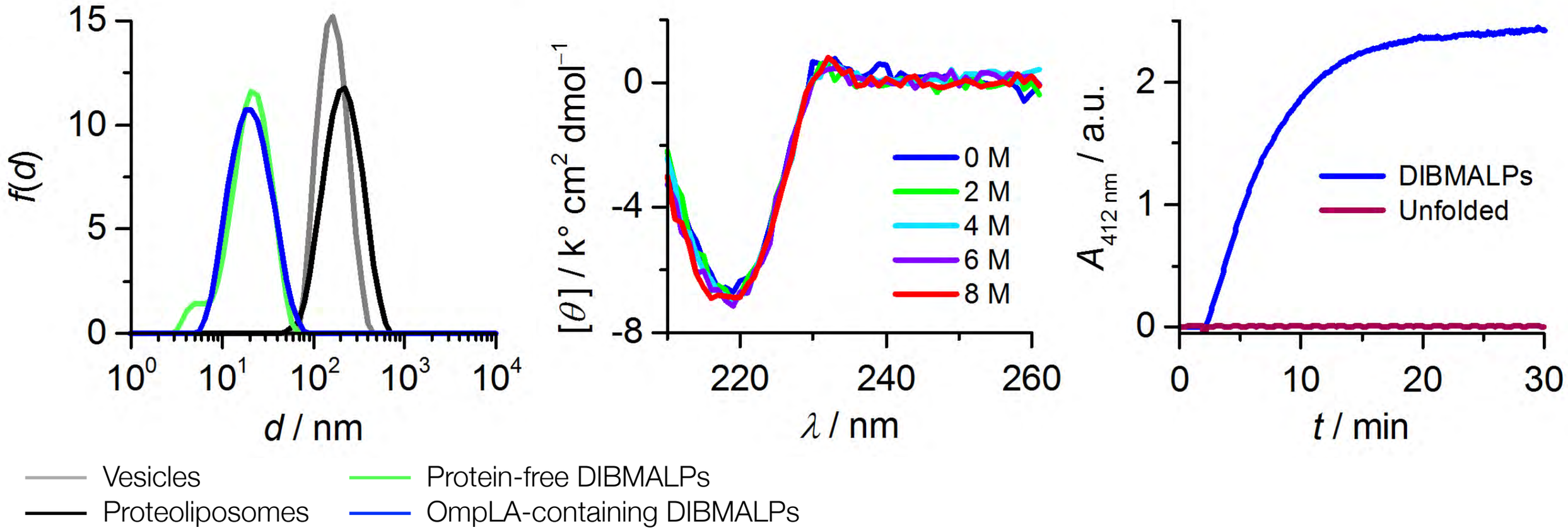
- integral membrane enzyme
- differential migration on SDS-PAGE (folded vs. unfolded)





Frotscher et al. *Angew. Chem. Int. Ed.* **2015**, *54*, 5069; Herrmann et al. *Eur. Biophys. J.* **2015**, *44*, 503

Solubilisation of OmpLA in DLPC



Nanodisc formation from proteoliposomes:

- as efficient as from protein-free DLPC vesicles
- OmpLA remains natively folded and enzymatically active

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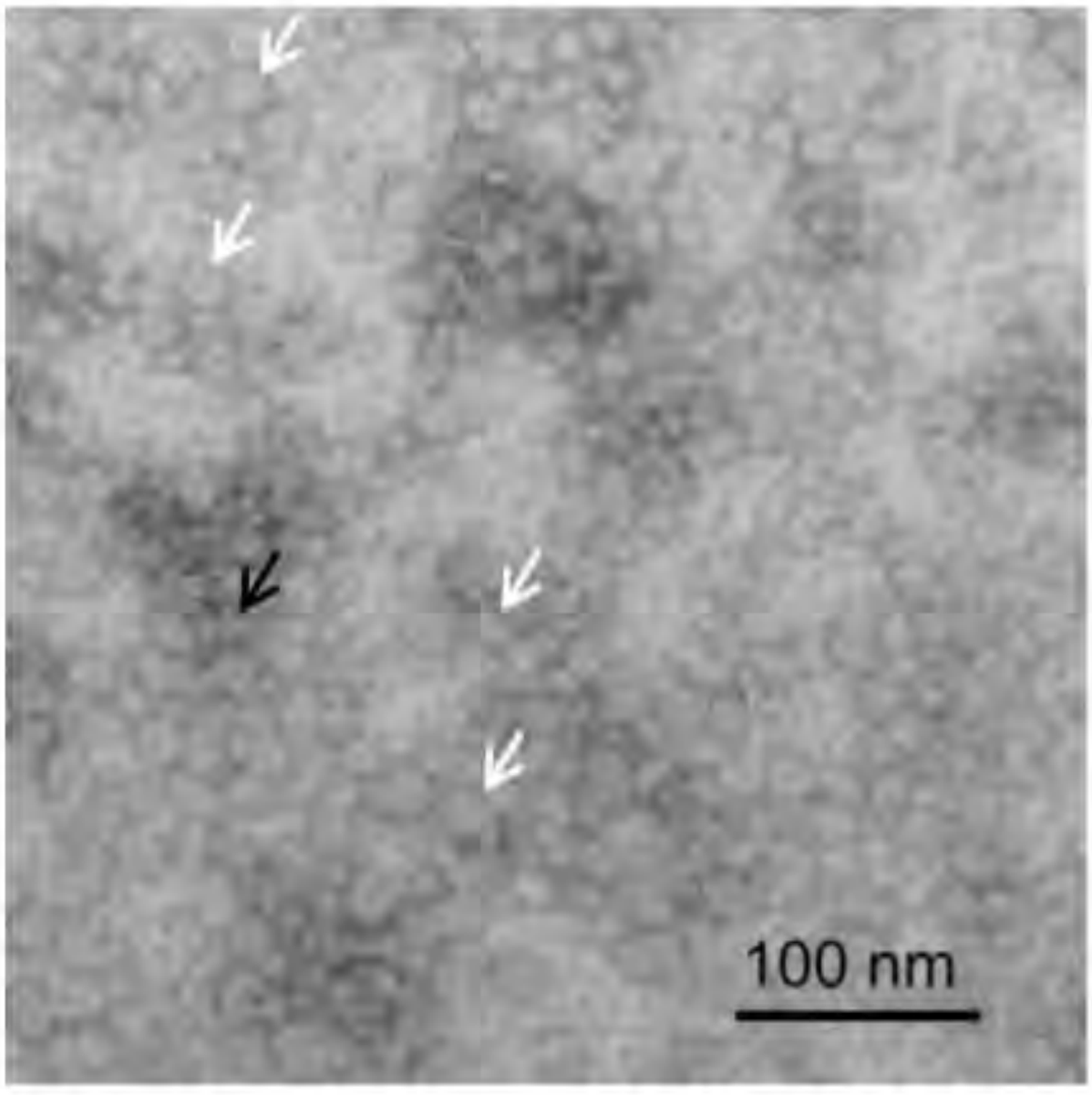
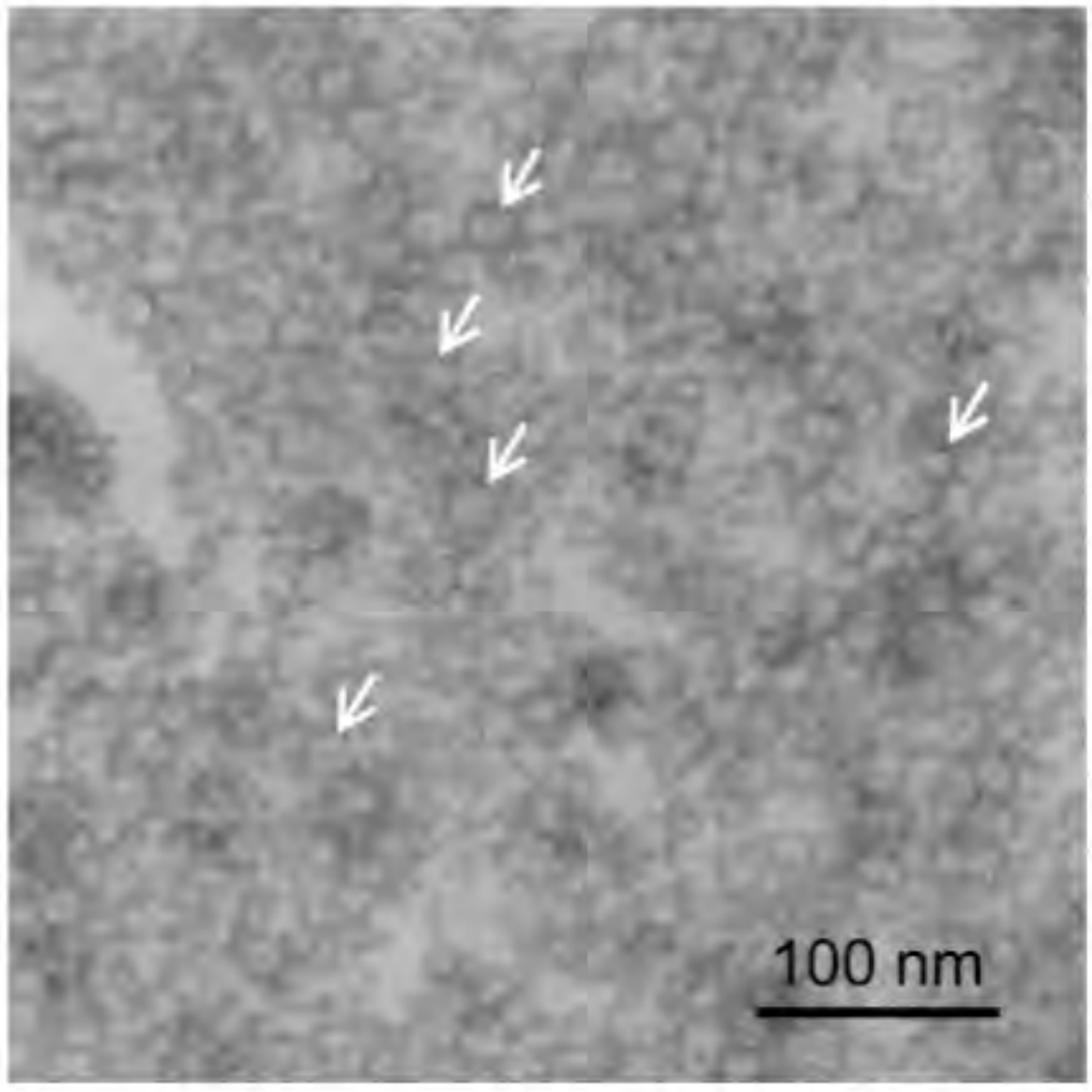
Transmission electron microscopy

Protein-free DLPC discs

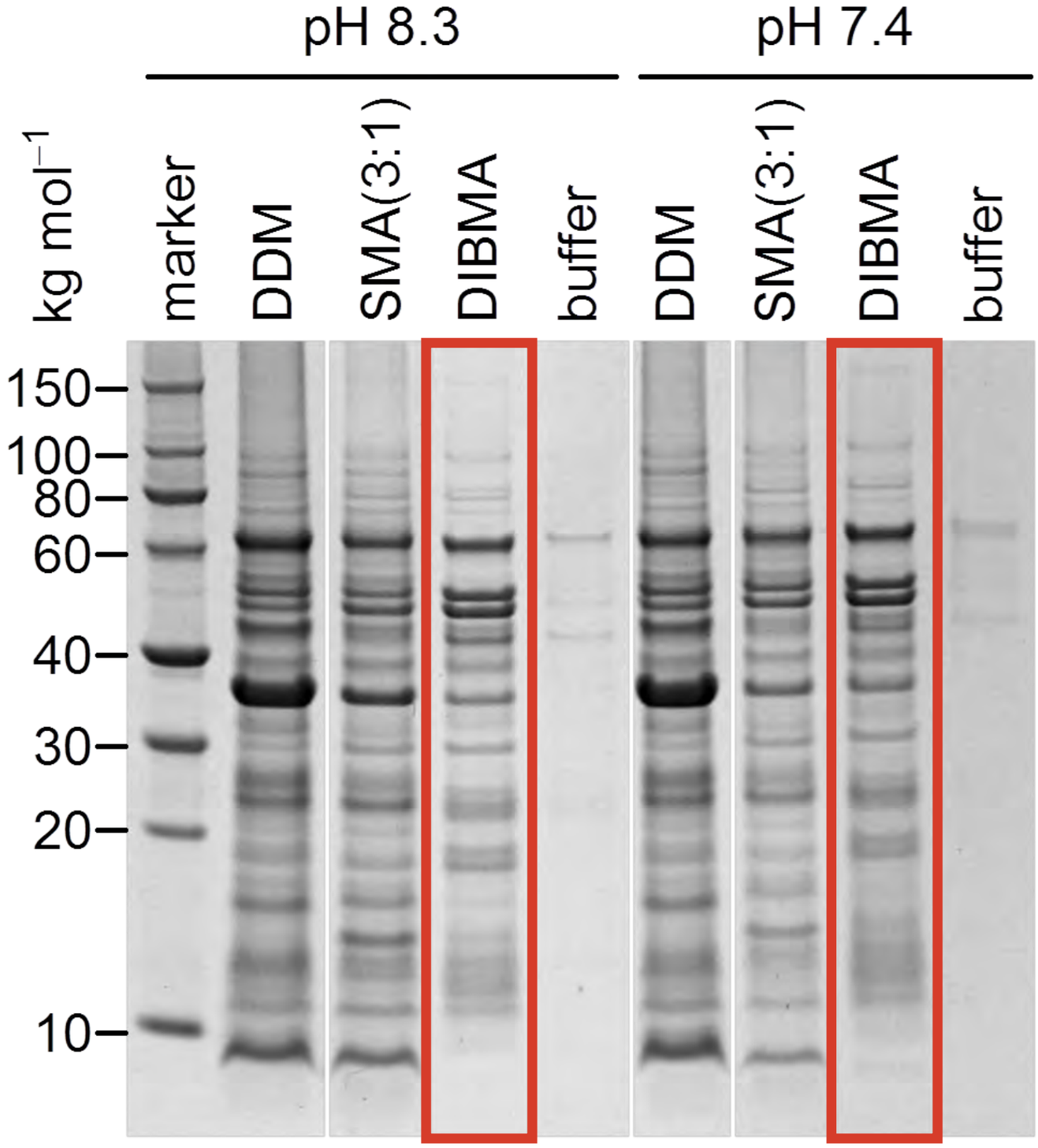


OmpLA-containing discs



Oluwole et al. *Angew. Chem. Int. Ed.* **2017**, *56*, 1919

Solubilisation of *E. coli* membranes



Oluwole et al. *Angew. Chem. Int. Ed.* **2017**, *56*, 1919

Take-home messages

Aliphatic DIBMA is a promising alternative to SMA, as it is less perturbing to lipid order and compatible with UV spectroscopy and divalent cations.

Both SMA and DIBMA solubilise a wide range of membrane proteins directly from cellular membranes to form lipid-bilayer nanodiscs.

SMALPs rapidly exchange lipids and, thus, represent equilibrium rather than kinetically trapped structures (*Sci. Rep.*, DOI: 10.1038/srep45875).

Acknowledgements

Molecular Biophysics Group

Simone Adkins, Rodrigo Cuevas Arenas, Bartholomäus Danielczak, Tim Diederichs, Markus Fleisch, Erik Frotscher, Dr. Katharina Gimpl, Anne Grethen, Ina Heimann, Jessica Klement, Johannes Klingler, Georg Krainer, Florian Mahler, Abraham Olusegun Oluwole, Johannes Schnur, Dr. Martin Textor, Dr. Carolyn Vargas, Andreas Werle-Rutter

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Dr. Anne Martel, Grenoble (FR)
Dr. Lionel Porcar, Grenoble (FR)

DFG
DAAD
Stiftung Rheinland-Pfalz für Innovation
Phospholipid Forschungszentrum / Research Center Heidelberg
Carl Zeiss Stiftung
RTG 1830 GERMAN CANADIAN
Wilhelm und Else Heraeus Stiftung
COMPLEX MEMBRANE PROTEINS IN CELLULAR DEVELOPMENT AND DISEASE
Malvern
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