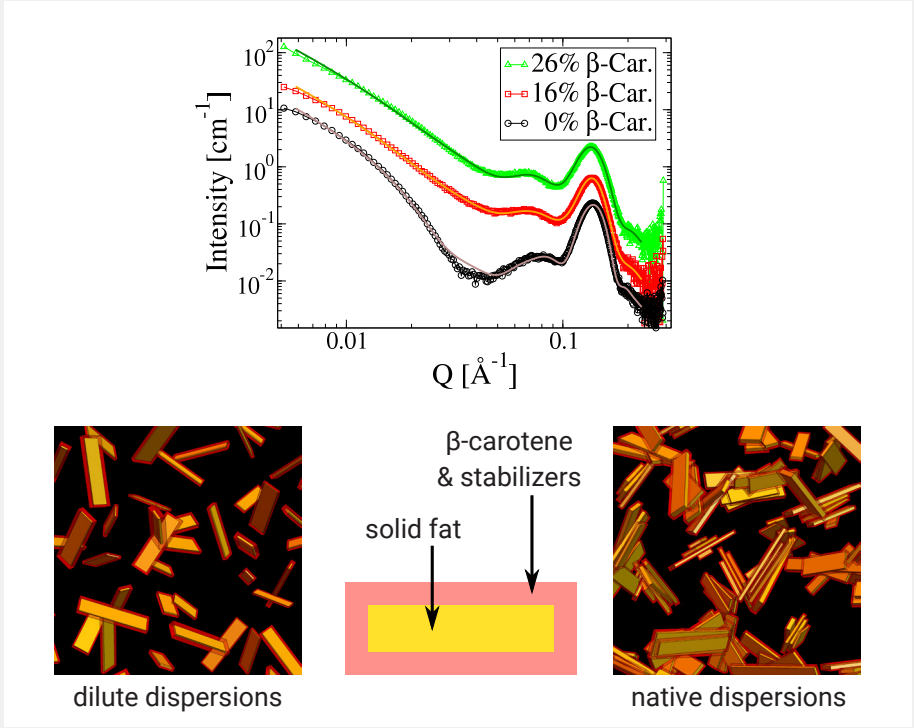
Solid lipid nanoparticles to color food

In this project, researchers from University of Copenhagen and Chr. Hansen A/S studied solid lipid nanoparticles (SLNPs) loaded with beta-carotene pigment using small angle X-ray scattering (SAXS). These measurements showed that the pigment was distributed on the surface of the SLNPs and not encapsulated in the interior.

Chr. Hansen is a global supplier of colors from natural sources, such as berries, roots, and seeds. These are used in many food products including beverages, confectionaries, ice creams, and dairy products. Often times the pigments need to be encapsulated in suitable carriers, which could be SLNPs. The distribution of pigment in the SLNPs is important for properties such as stability and visual appearance. This is crucial for using the pigments in food products but difficult to study. SAXS is the ideal tool for studying the structure of such nanoscale colloidal systems.



SAXS data of SLNPs with different loadings of beta-carotene shows that the particles adopt a core-shell platelet structure where the pigment is likely sitting on the surface of the particles. For concentrated samples, the platelets self-assemble into larger stacks.

What we did

- Chr. Hansen SLNP samples loaded with different amounts of beta-carotene were measured with SAXS at the Niels Bohr Institute.
- The analysis shows that the SLNP particles are crystalline platelets that self-assemble into larger stacks in concentrated samples.
- The loading of beta-carotene has a large influence on the SAXS signal, showing that the pigment changes the structure of the particles.
- Modeling shows that the colorants are probably not encapsulated in the particles but situated at the platelet surfaces.

"This project has helped us understand the inner structure of pigment loaded solid lipid nanoparticles in more detail. SAXS has proven to be the ultimate tool in determining these sub-micron structures, and has really assisted in elevating our knowledge of these systems."

- Jakob Schjoerring-Thyssen, Product Development Manager, Chr. Hansen

In the LINX project, researchers at leading Danish universities collaborate with scientists in industry to solve industry relevant problems using advanced neutron and X-ray techniques. The Arleth group at University of Copenhagen contributes with their expertise in small-angle scattering techniques.

Read more
linxassociation.com

Contact
Lise Arleth: arleth@nbi.ku.dk

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