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Foam based on fish skin collagen by-product: a colloidal approach

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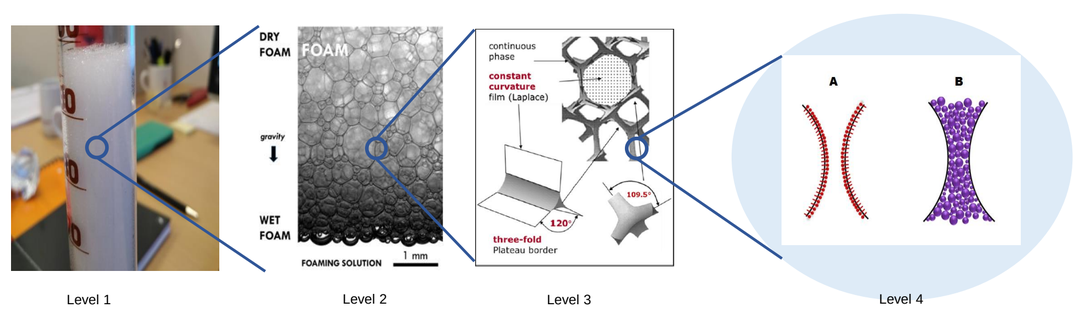
Foams are the essential building component of many aerated food structures: breads, cakes, extruded and expanded cereal, whipped creams, ice creams.

A foam's set state is directly related to its structural stability. Proteins are commonly used to produce food foams with long-term stability.

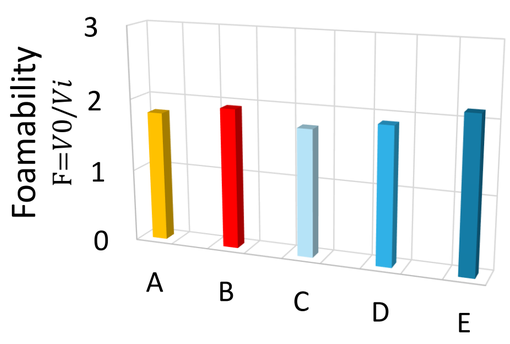


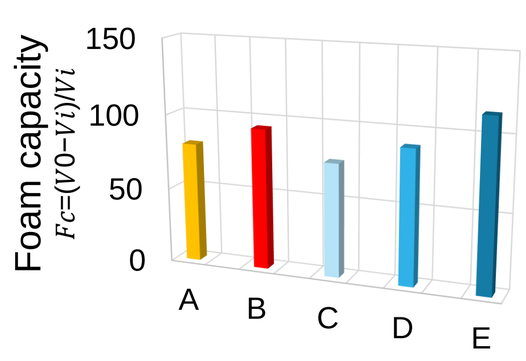
Level 1 – foam scale: liquid fraction, stability, rheology, viscoelastic behavior, yielding behavior, steady-flow behavior
Level 2 – bubble scale: mean bubble size, distribution of bubbles sizes, bubble rearrangement dynamics [(1)]
Level 3 – lamella scale: thickness, uniformity, permeability, stability [(2)]
Level 4 – interfacial scale: dynamic and equilibrium conditions of protein absorption, interfacial tension reduction, rheological properties [(3)]

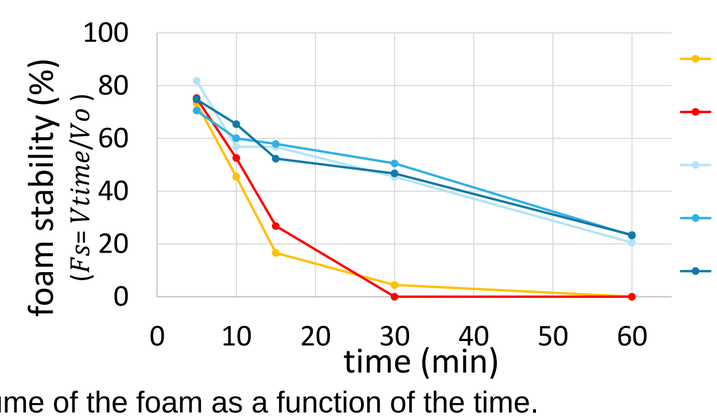
Recent changing in consumption trends, due to ecological problems, animal welfare, allergies, sanitary and religious restrictions, have led to making a concerted effort to find alternative protein sources that can provide similar functionalities in food systems. The large quantities of by-products generated by the fish-processing industry are a potential source for the production of gelatin.

Research question : Can gelatin by-products be employed as alternative sources of protein ?

We compared the *Foamability* (*F*), the *Foam capacity* (*Fc*) and the *Foam stability* (*Fs*) of 2 commercial fish collagen samples (A and B) and 3 fish skin by-products collagen (C, D and E).







V_0 is the volume of the foam after formation, V_i is the volume of the liquid and V_{time} is the volume of the foam as a function of the time.

Partial conclusions: No significant difference was observed in terms of *F* between the samples. Better *Fc* (+ 25 %) was observed for the sample E. Fish skin by-products collagen present greater *Fs* compared to commercial sample: sample C, D and E present 48 ± 2 % of *Fs* after 30 min whereas A and B present only 4.4 % and 0 %.

Future directions: In order to deeper investigate and better understand these differences, other analytical approaches are planned: dynamic interfacial tension, ellipsometry, film pressure balance as well as small angle X-ray scattering (SAXS).

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(2) Brakke K. **(1992)**. The Surface Evolver Exp Math 1(2):141–65.
(3) Fameau, A. L., Salonen A. **(2014).** Effect of particles and aggregated structures on the foam stability and aging. Comptes Rendus Physique, 15, 748-760.

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