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Foaming and interfacial properties of gelatin from fish skin

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Intro

The large quantities of by-products generated by the fish-processing industry are a potential source for the production of gelatin.

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

Can gelatin from fish skin be employed as a good foaming agent in food applications?

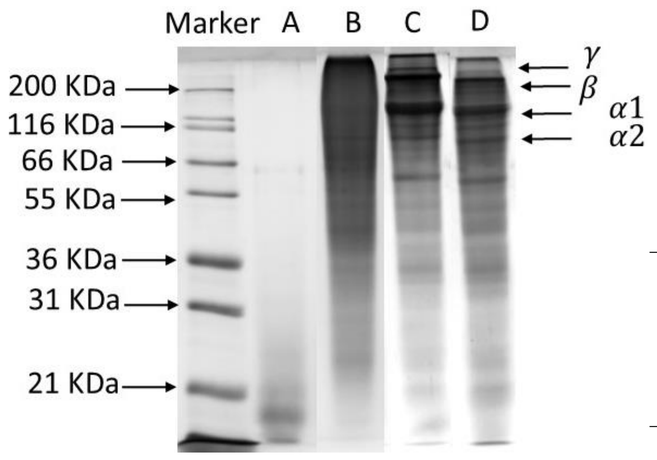
Strategy

A and B (commercial fish gelatin)
C and D (fish skin gelatin)

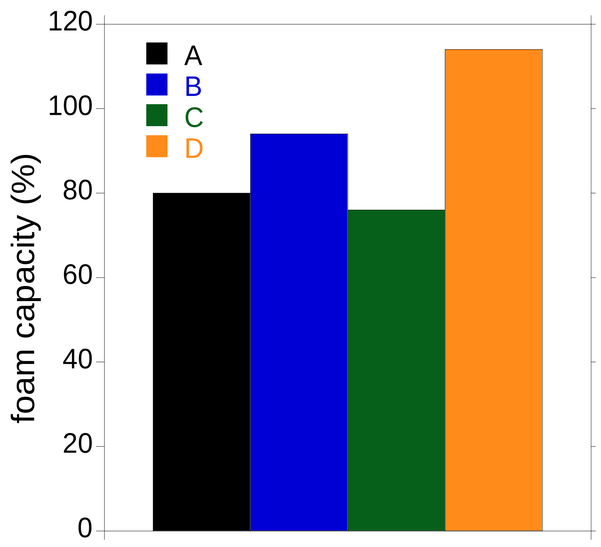
- Chemical composition
  - Amino acid analysis
    - SDS-PAGE
      - Double wall ring interfacial rheology
        - Foaming properties

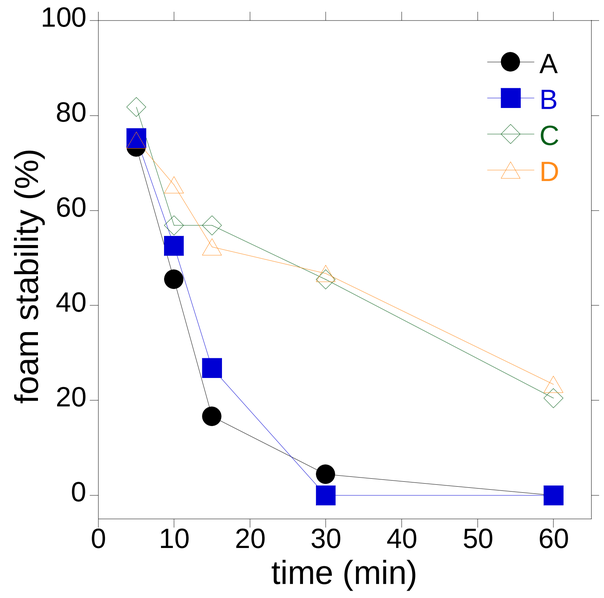
Results

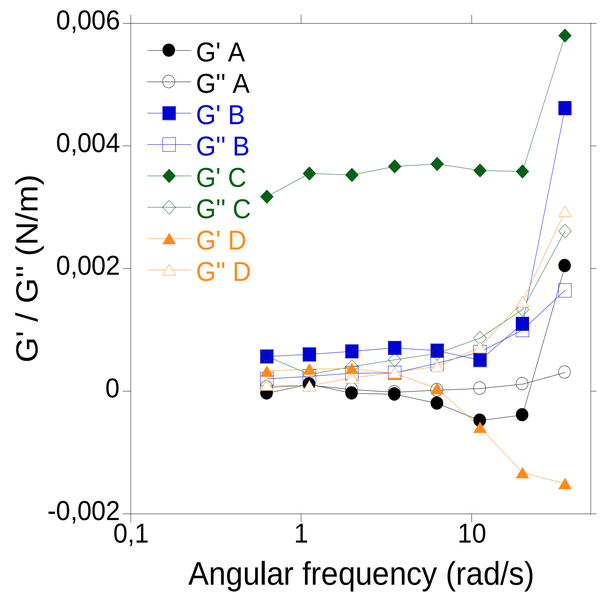
Amino acid (residues/1000 residues)	A	B	C	D
Arginine	64	58	57	74
Serine	43	68	65	68
Hydroxyproline	99	68	73	71
Glycine	252	271	289	272
Threonine	26	25	15	28
Alanine	93	93	102	85
Proline	107	94	105	92
Methionine	12	17	7	12
Aspartic acid	58	63	60	58
Valine	50	49	52	45
Histidine	7	10	5	9
Lysine	35	28	28	33
Glutamic acid	91	95	113	99
Tryptophan	0	0	0	0
Leucine	26	23	10	20
Phenylalanine	15	15	7	13
Isoleucine	20	22	11	20
C-C	0	0	0	0
Tyrosine	3	3	2	3

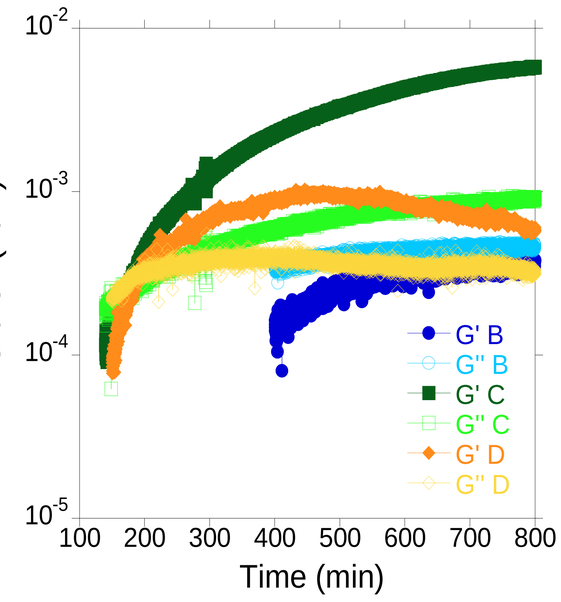


Sample	Moisture (%)	Ash (%)	Protein (%)	Fat (%)
A	5.41 ± 0.64	0.14 ± 0.12	95.36 ± 0.23	0.32 ± 0.18
B	11.73 ± 0.08	0.18 ± 0.03	94.24 ± 0.72	0.29 ± 0
C	7.09 ± 0.06	27.62 ± 0.11	71.33 ± 0.34	0.78 ± 1.09
D	4.81 ± 1.28	24.39 ± 1.06	60.34 ± 1.48	0.05 ± 0.01









Partial conclusion

- Small peptides for sample A (no distinct bands for B)
  - Higher viscoelastic properties for sample C
    - **Gelatin from fish skin (sample C and D) present +48 ± 2 % of foam stability after 30 min compared to A and B.**

Future directions

- Pendant drop, ellipsometry, film pressure balance as well as small angle X-ray scattering (SAXS) to understand these differences
  - Combined effect of ultrasound, pH varying and temperature to increase foam stability

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