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Fusible Filter medium

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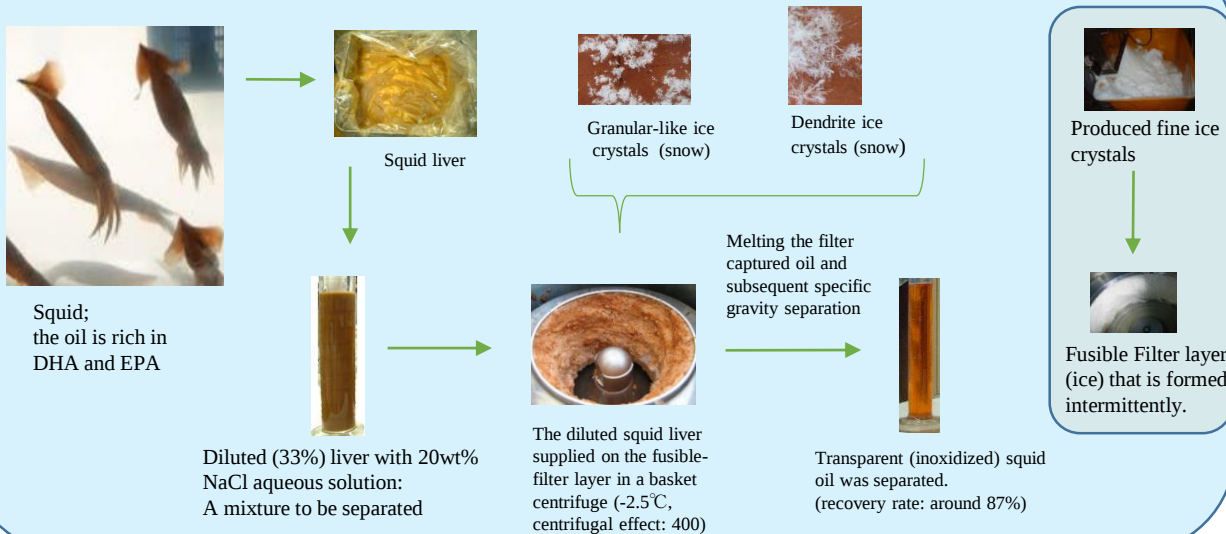
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Significance

We propose a new filtration method and apparatus using a fusible filter medium (FF). The advantages of FF are:

- 1) materials captured by the filter can be recovered by melting the filter and subsequent specific gravity separation,
- 2) the filter medium can be recycled, and
- 3) the latent heat of solidification removed to produce FF is significantly lower than that of vaporization.

Separation of emulsified-squid oil using ice filter layer



Existing techniques

One preferred mode of our proposed filtration method is an application to oil-containing biomaterials. Existing techniques, such as sedimentation centrifuges (e.g., Batch laboratory equipment, disk centrifuges, and decanter centrifuges), solvent extractions (e.g., using hexane, and acetone), and coalescers with fiber bundles, are frequently associated with difficulties in separation as follows: 1) Oil separated using the sedimentation centrifuges face accumulating of protein-coated oil emulsion droplets, which are stable at ambient temperatures or lower. 2) The solvent extractions reduce the separation efficiencies due to protein surfactants. Moreover, hexane and acetone are extensively used even though they are known to be explosive materials. 3) As for the Coalescer with fiber bundles cannot be applied to putrefactive or liquid/solid mixtures.



Separation of squid oil from the liver by a batch-laboratory equipment with the centrifugal effect of 10,000 at 0°C (a:100% liver, b:50%). The separated oil form a layer (upper yellow layer in photograph) accumulated the emulsified oils that are coated with proteins.

Ambient-Temperature Fusible Filter (ATFF): Separation of emulsified-rapeseed oil using TME·3H₂O filter layer

The important characteristics of filtration with an ATFF is that melting or solidification of the filter can be carried out at an ambient temperature, resulting in a simpler and more cost-efficient (running and capital) FF apparatus.

The characteristics of TME·3H₂O

	TME·3H ₂ O	Water
Solidification point °C	30	0
Latent heat of solidification kJ/kg	218	335
Specific heat kJ/kg/°C	2.75 (10°C) 3.58 (50°C)	4.19 (0°C) 4.18 (50°C)
Density kg/m ³	1,120 (10°C) 1,090 (50°C)	1,000 (0°C) 990 (50°C)

