

How can I make a Tissue Mimicking Phantom Gel for HIFU experiments?

HIFU lesion shape and size can be visualized by applying HIFU treatment to an egg-white-based Tissue Mimicking Phantom Gel. The gel is reported to have very similar acoustic characteristics to human skin.

200 ml portions can be prepared with chemicals available from normal laboratory suppliers according to the following recipe:

- Stock solutions of 10 wt% Ammonium Peroxodisulphate in DI water should be relatively fresh. It is not recommended to use stocks that are more than 2 days old due to the gradual degradation of the chemical in water.
- Commercially available pasteurized egg-white from local supermarkets should be used for each batch.
- The egg-white is thoroughly stirred and 120.0 g is weighed into a beaker.
- 30.0 g Acrylamide 40% Solution - BIS 19:1 is added. *NOTE: This chemical is hazardous, and should only be handled in a fume-cupboard with use of nitrile gloves.*
- 30.0 g undiluted pH 9.0 10x TRIS buffer is added.
- 30 drops, corresponding to approximately 0.9 g, Tetra-methyl-ethylene-diamine (TEMED) is added under gentle stirring.
- To initiate the gel reaction, 5.2 g of the stock Ammonium Peroxodisulphate stock solution is added under gentle stirring.
- The sol should be poured quickly into the desired forms.
- Leave the sol overnight at 100% RH for gel-formation (closed container containing a water bath).

Due to the content of egg-white protein, the TMP gel transitions from a semi-transparent yellow color to opaque white at elevated temperature. The transition temperature is 60 – 65 °C

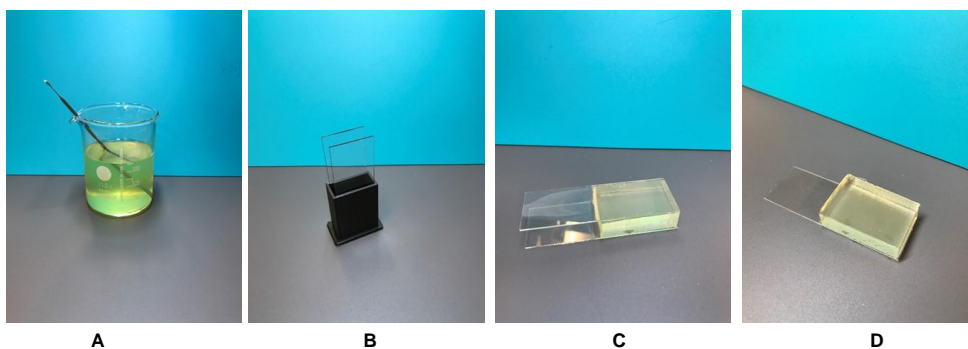


Fig. 1. A: Sol after mixing in beaker. B: Sol is poured into 3D printed form in-between two Menzel glasses. C: TMP Gel 12 h after cast. D: Top cover-plate removed before HIFU test.

For further reading on TMP gel please see following reference:
Divkovic G and Jenne JW. Egg White Phantoms for HIFU. *Int. Symp. Therapeutic ultrasound* 2005. 143-146.

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