

# Fabrication of Photocurable 3D Printer material with Viscosity and UV Curing time

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## Abstract

The viscosity of the photo-curable monomer and polymer is measured by blend ratio of the material. The photo-curing polymer is produced through physical or chemical reaction, and the curing time and physical properties of the material are adjusted according to the purpose. It can be controlled the ratio of the photo initiator and polymer. For example, PEG di-acrylate series based on polyethylene glycol (PEG) and acrylate blend were used for DLP(Digital Light processing) 3D printing. In this experiment used two kinds of initiators to control. After that, it is output according to the photo-curing time adjustment.

## Objective

1. Blending PEG and Acrylate contents to make a PEG-Acrylate products
2. Evaluation the physical properties and comparisons according to curing time difference
3. To compare the viscosity of PEG-Acrylate blend

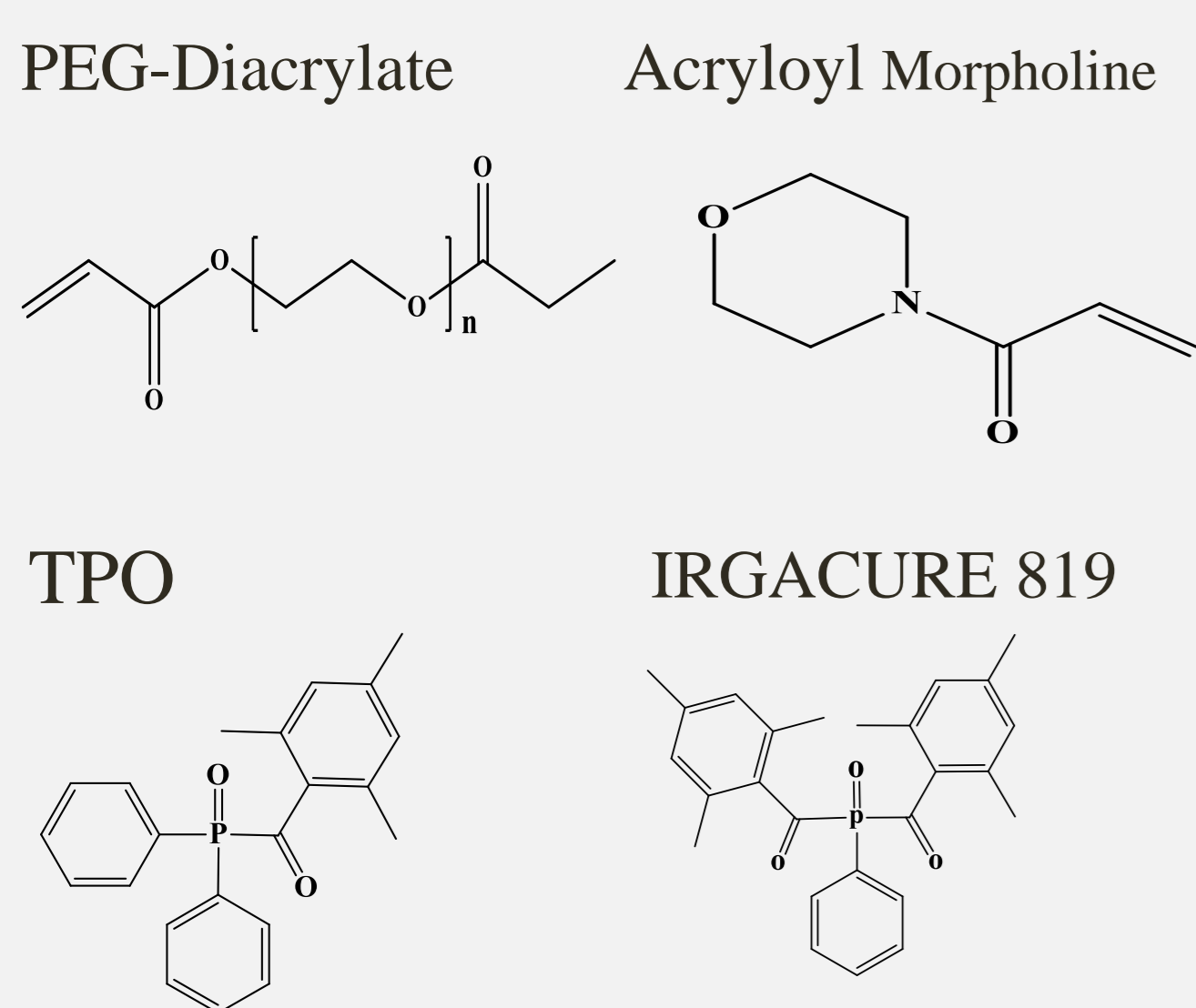
Blending of PEG with Acrylate

High mechanical properties compared to the each other

Reduce the photo-curing time used by acrylate ratio

Apply to future 3D Printer due to viscosity control

## Materials



## Experimental

Step 1 Poly(ethylene glycol) Diacrylate + ACMO ( Acryloyl Morpholine)

Step 2 Addition of Photoinitiator

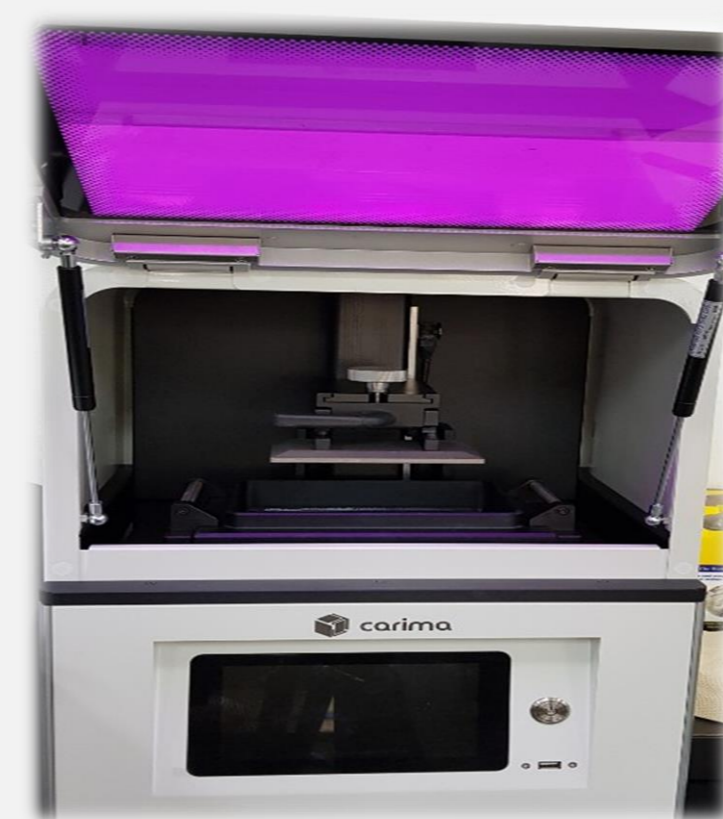
Step 3 Adjust to proper viscosity for DLP method

Step 4 Adjust to Curing time control

## VISCOSITY

SAMPLE	VISCOSITY	CONDITION	
Blend TYPE A + TPO	27595mPa.s	SHEAR RATE	50s <sup>-1</sup>
Blend TYPE A + 819	28626mPa.s		
Blend TYPE B + TPO	30082mPa.s	DURATION	60sec
Blend TYPE B + 819	28411mPa.s		

## Results



1. Used by Carima DLP 3D printer
2. Printed it out by controlling the curing time
3. SEM images were taken at 100 and 500 times the surface and side laminated areas

## SAMPLE

A Type + 819



A Type + TPO



B Type + 819



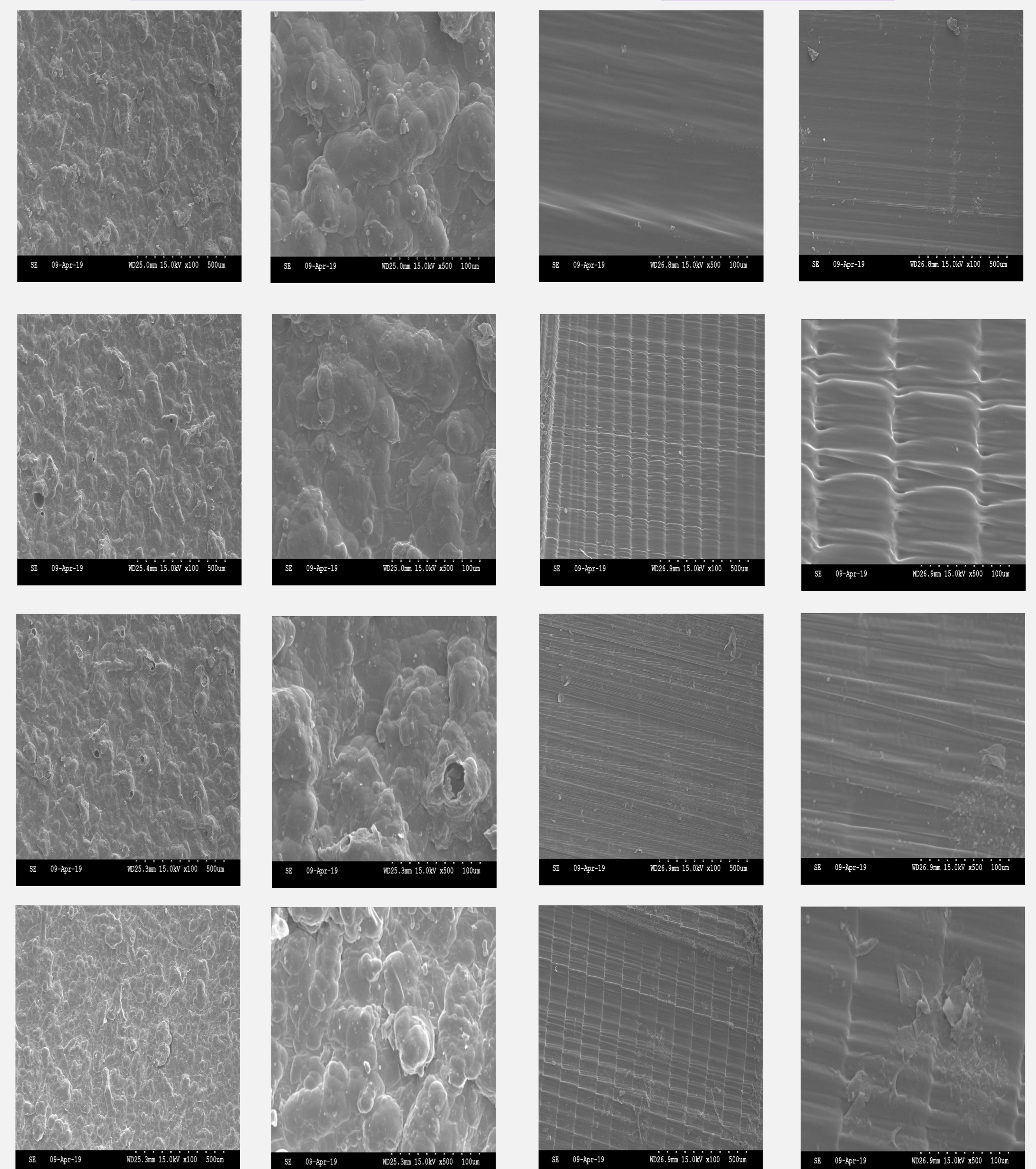
B Type + TPO



## SEM IMAGE

### Surface

### Side



## Conclusion

- The successful fabrication PEG-Diacrylate blend and UV-cured by the photo-initiator
- As a result of SEM imaging, it was confirmed that the side lamination was better when TPO initiator was used.
- With the appropriate viscosity and blend ratio, we have successfully produced printouts using 3D printer.

## Acknowledgement

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