

# Production and molding of full and partial bio-based poly aryl ether ketone composites as new performance super engineering plastics

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## Introduction & Objective

PAEK (polyaryletherketone) is a high-performance thermoplastic polymer that is known for its high strength, stiffness, heat resistance, chemical resistance, and dimensional stability. It is often used in various industrial sectors such as automotive, aviation, spacecraft, electronic/electrical industries, and medical devices [1,2].

Vanillin methyl ether and phenol, found in straight lemongrass and Passiflora edulis Sims, are important fine chemical intermediate and is widely used in the synthesis of food spices and fragrance formulations. In this research, Vanillin methyl ether and phenol based PAEK was prepared [3].

**Objective :** Using bio-based resources to synthesize an ultra-high-strength poly aryl ether ketone super engineering plastics

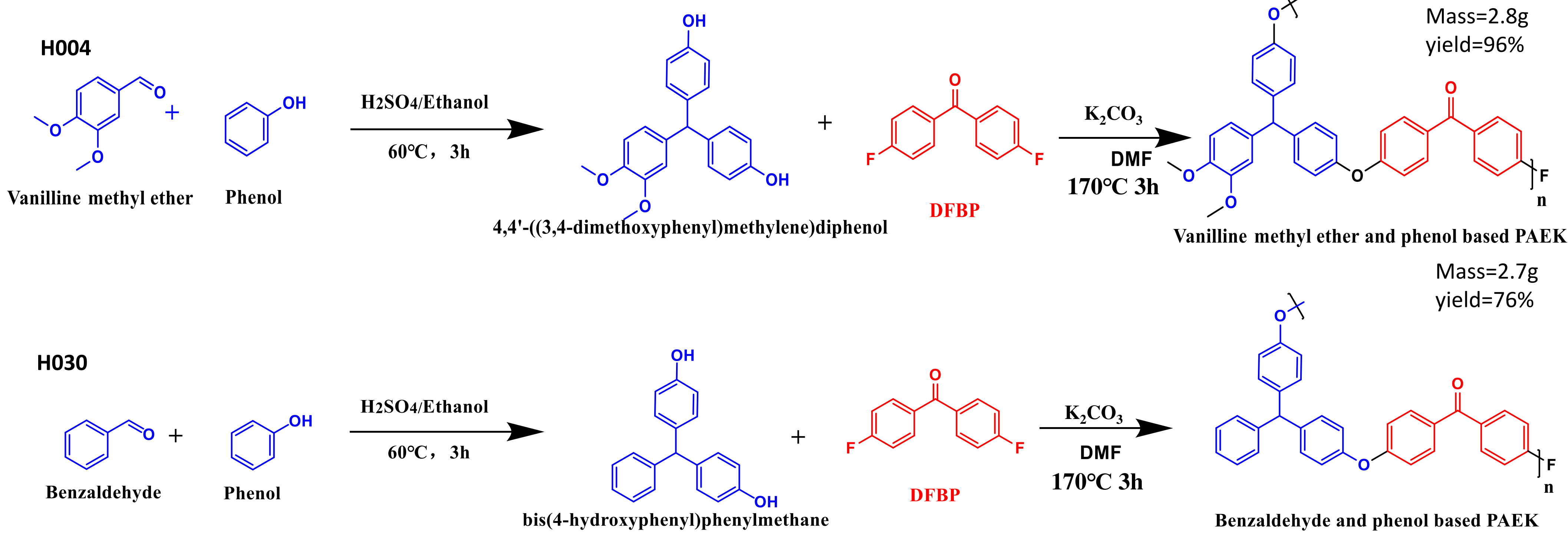
The effect of benzaldehyde based PAEK on the polymeric properties were also studied to compare the performance according to the results from NMR, FTIR, XRD, SEM, TGA, DSC, SEC, and contact angle.

Recently we tried to produce a plastic sheet in the extrusion, the material started to melt at 80 degrees and afforded a brittle sheet at room temperature.

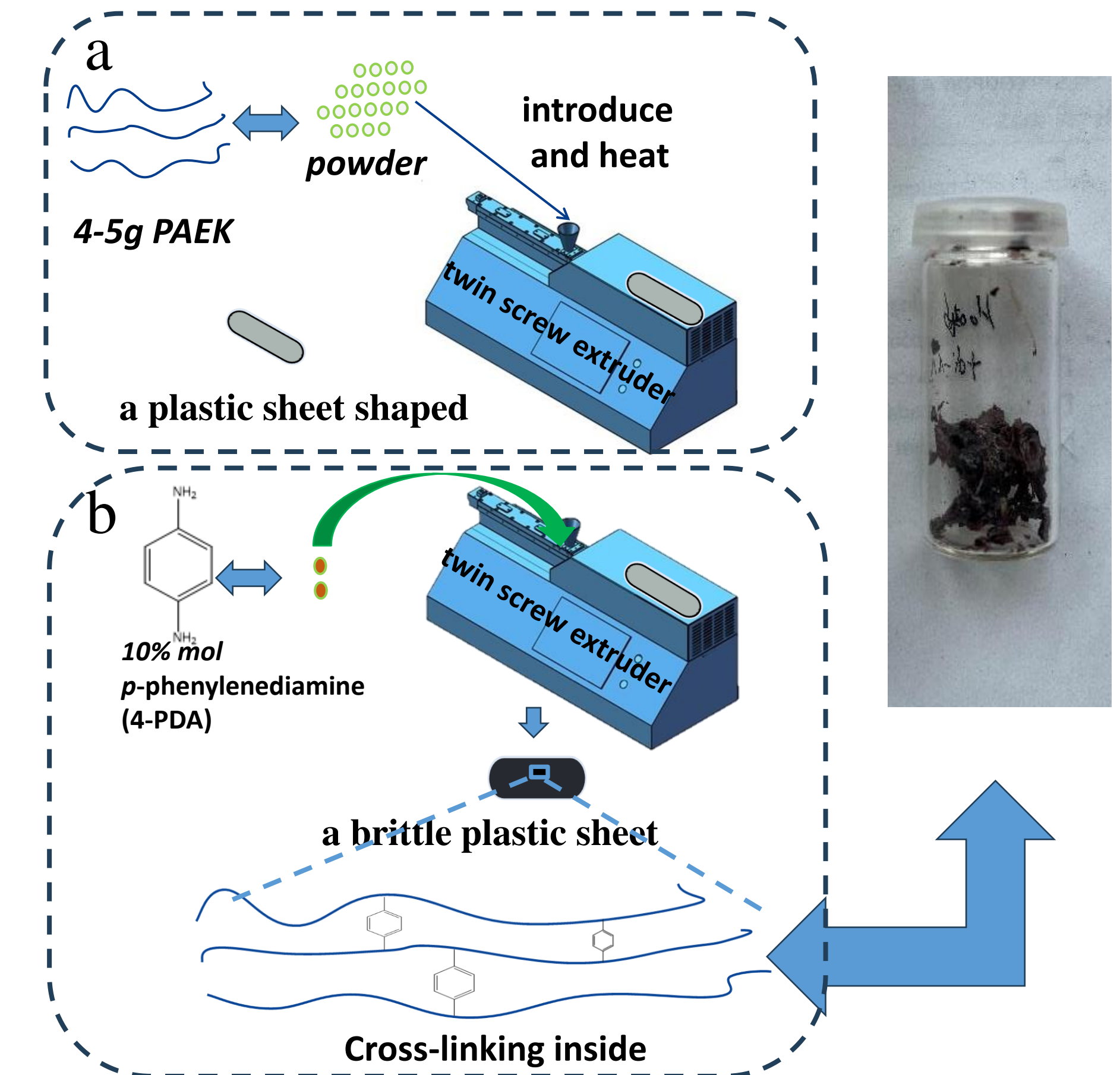
Therefore, this research provided a solid theoretical and experimental basis for the preparation of bio-based new performance super engineering plastics.

## Materials & Methods

### I- Synthesis of bio-based PAEK.



### II- Molding part



## Results & Discussion

### structure

#### FTIR spectrum

It reveals the FTIR spectra of these polymers. It can be seen the absorption bands at  $3432\text{cm}^{-1}$ ,  $1645\text{cm}^{-1}$ ,  $1239\text{cm}^{-1}$  and  $1024\text{cm}^{-1}$  are the characteristic peaks of hydroxyl group residual, carbonyl group from ketone and ether bond from methyl alkyl aryl ether.

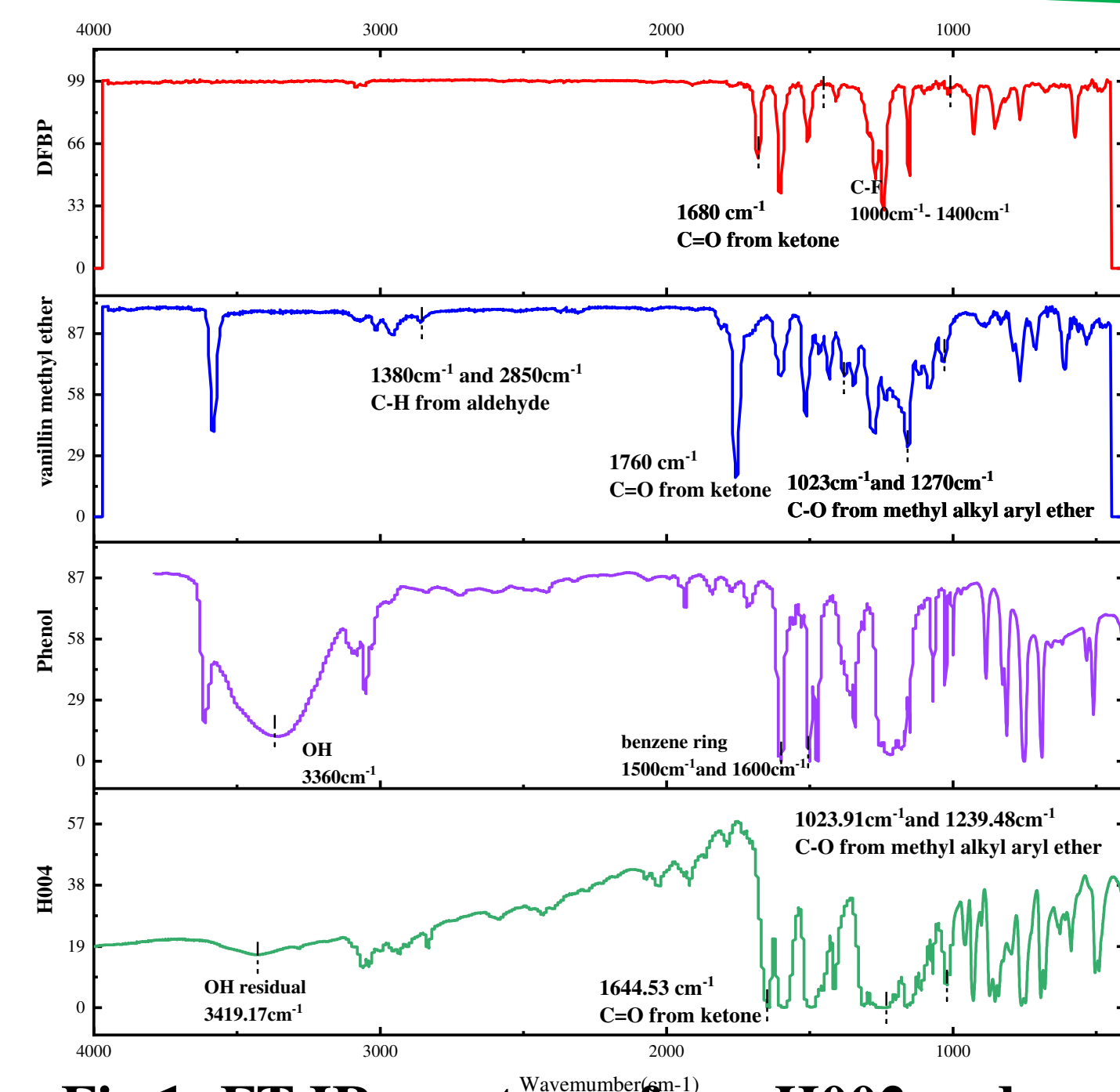


Fig 1 :FT-IR spectrum from H002 and reactants

#### NMR spectrum

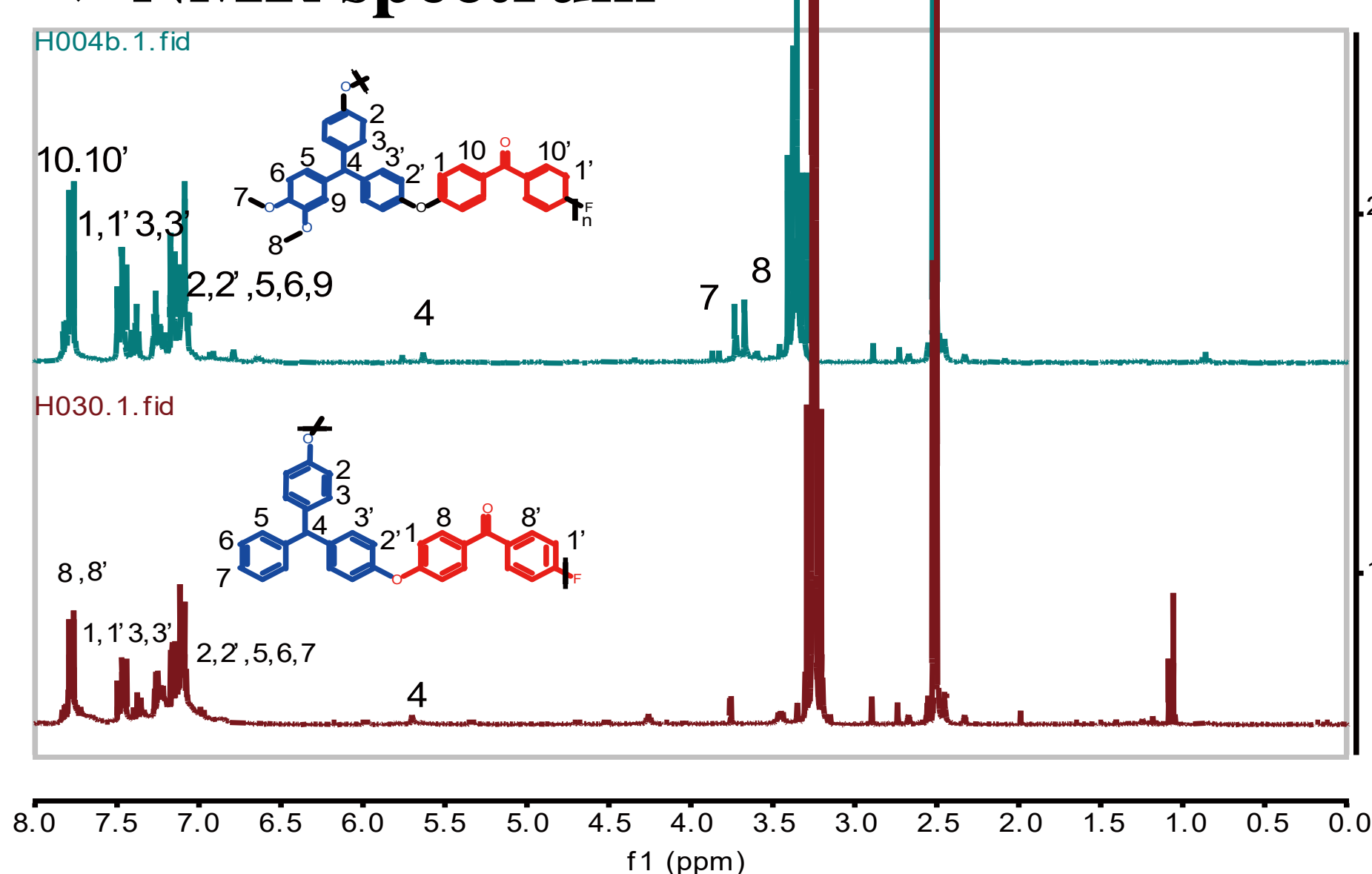


Fig 2 : <sup>1</sup>H-NMR spectrum of H004 and H030

The chemical shifts of 2.5ppm and 3.3ppm correspond to hydrogen atom of DMSO and H<sub>2</sub>O. The chemical shift of from methyl group appear at 3.7ppm and 3.8ppm.

### thermal properties and surface morphology

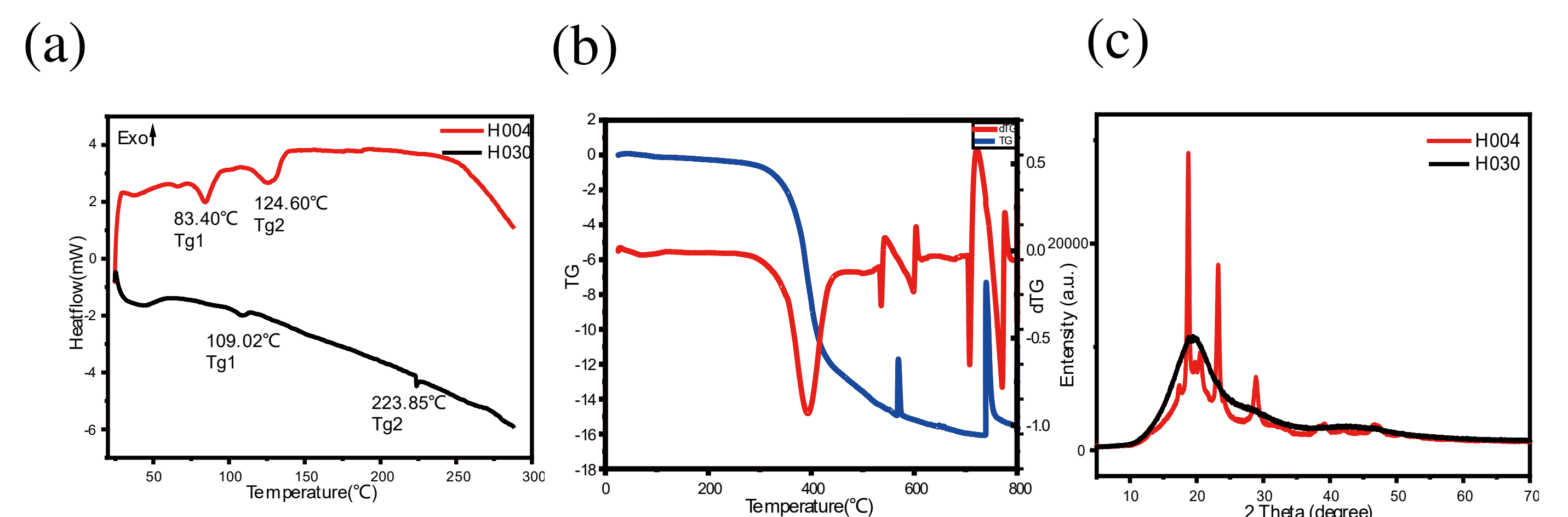


Fig 3 : The spectrum of (a) DSC (b) TGA , dTG and (c) XRD of this polymer

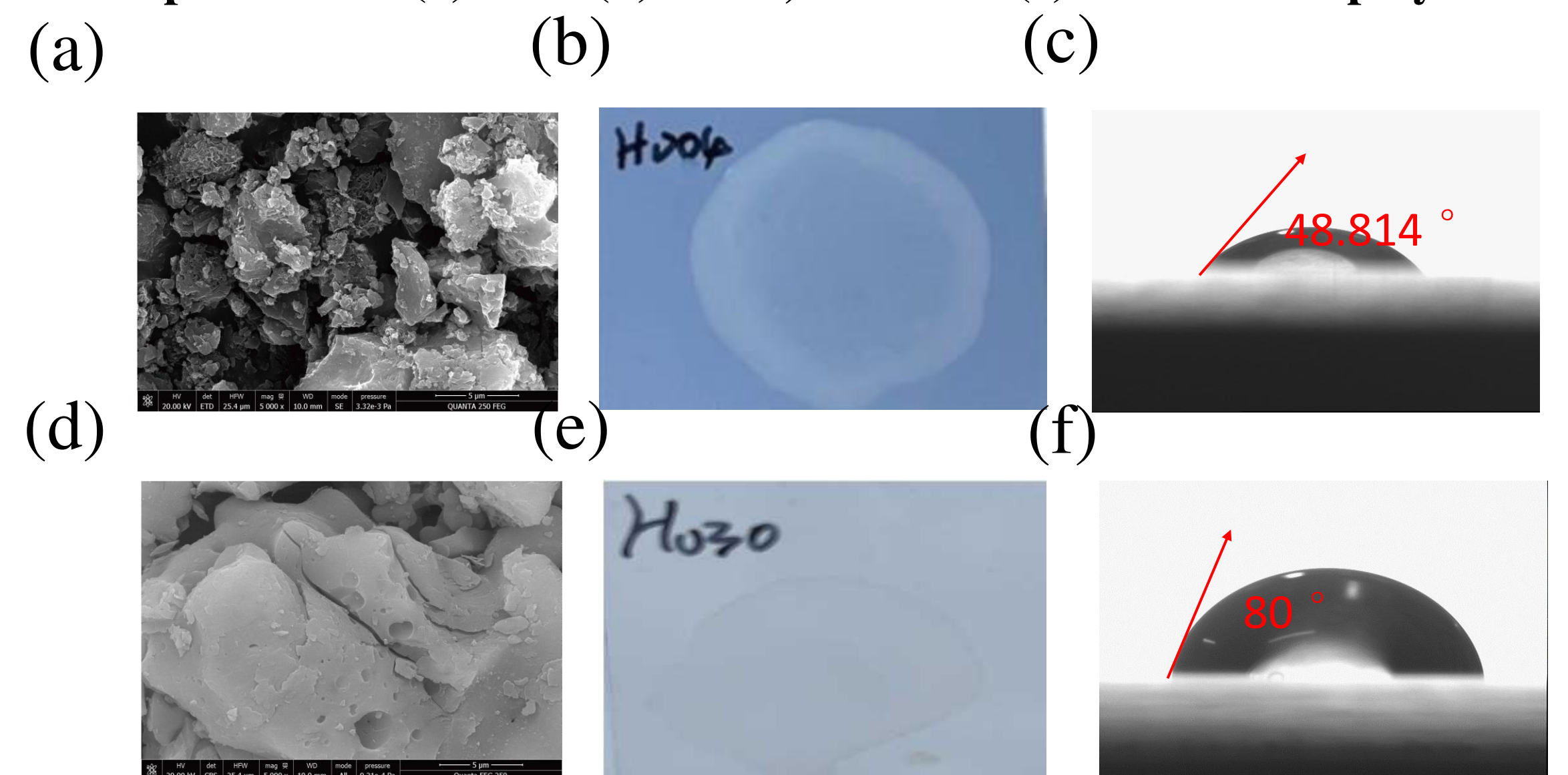


Fig 4 : The SEM images, thin film and contact angle images of (a-c) H004, (d-e) H030

## References

- [1] Zhang, Rui , et al. Polymer Degradation and Stability 195- (2022):195.
- [2] Kuhire, et al. Polymer international 70.8(2021).
- [3] Wu, Tonghua , et al. Composites science and technology Jan.5(2022):217.

## Conclusion & Perspectives

- ✓ Synthesis new bio-based polymers starting from lignin monomers such as vanillin, guaiacol, etc. At the same time, some data were collected.
- **Perspectives:**
  - ❑ Make modifications to the polymers we have done to improve their properties.
  - ❑ Finish the tests we need, FTIR, XRD, SEM, TGA, DSC, SEC, DSA and so on.
  - ❑ Use the twin-screw extruder to mold the polymers and make a cross-linking inside.