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### Toward Utilization of Agricultural Wastes: Development of a Novel Keratin Reinforced Soybean Meal-based Adhesive

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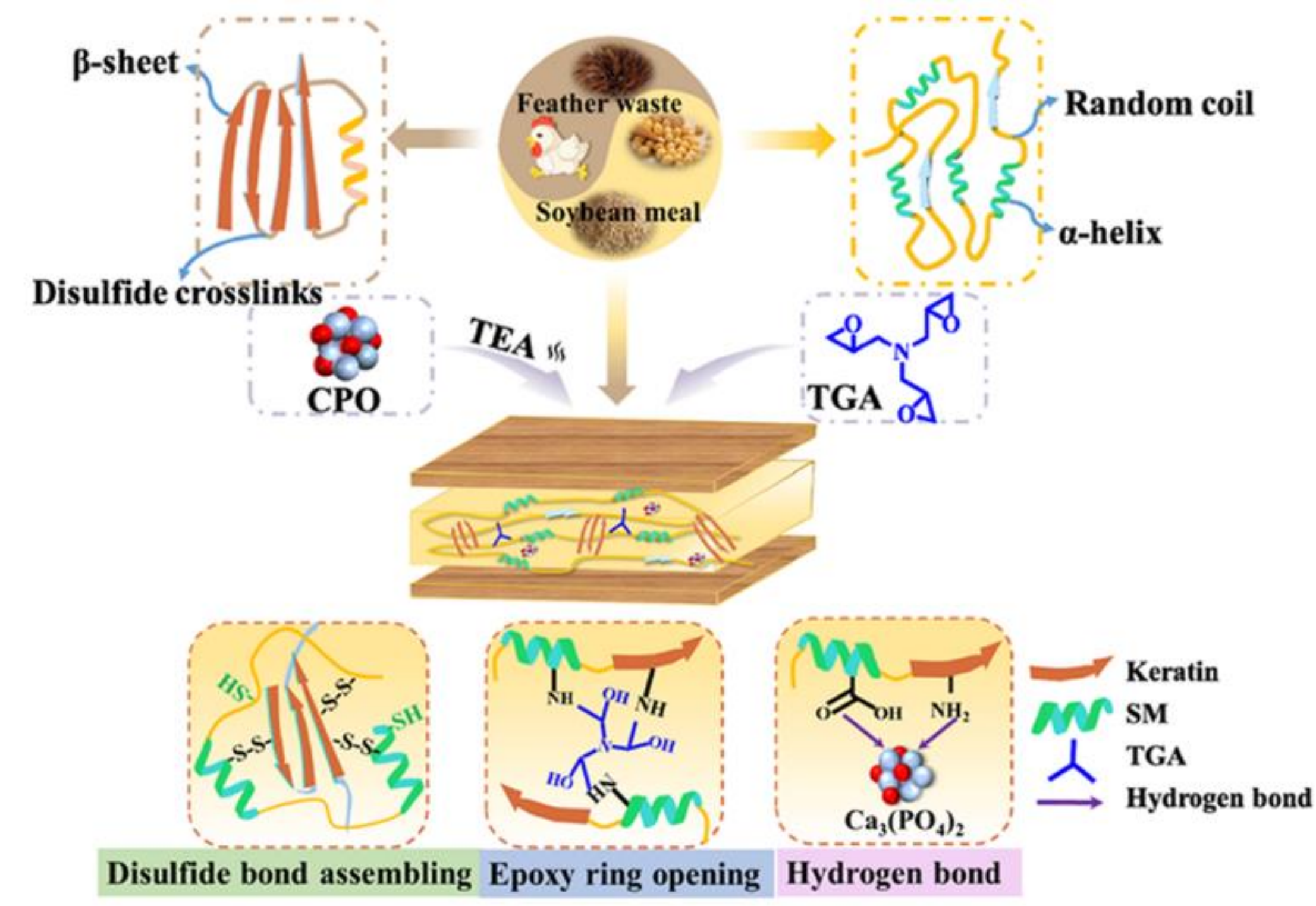
# Toward Utilization of Agricultural Wastes: Development of a Novel Keratin Reinforced Soybean Meal-based Adhesive

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## introduction

- Preparation of adhesive from agricultural waste: grafting of chicken feathers with soybean meal by novel mesoscopic strategy.
- Mechanically stronger due to biomineralization and organic polymerization process.
- Also, an epoxy crosslinking agent – TGA (triglycidylamine) was added for strong bonding.



## Challenges

- Adhesives produced by petroleum lead to depletion in resources
- Price fluctuations in petroleum affects the production
- Sustainable development demanded
- The mechanical strength of only soymeal as an adhesive is not enough.

## Why is this work important?

- Low-cost
- Bio-based
- Formaldehyde-free
- Effective conversion of raw material in agricultural & forestry waste

### soymeal

- Already studied as a great adhesive
- Low price
- Renewable

### Chicken feathers

- Mechanically strong
- Water resistance

## Results and discussion

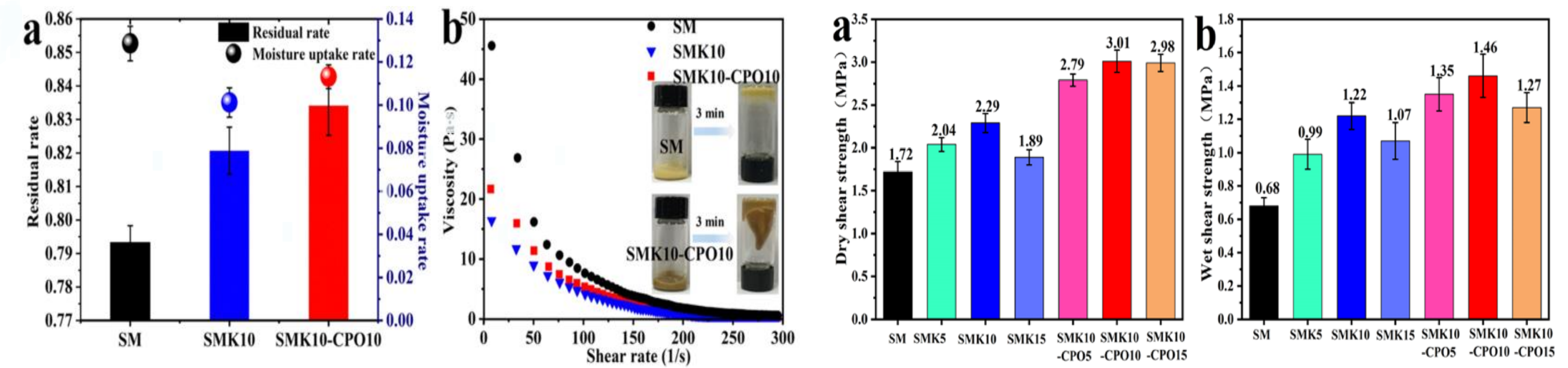
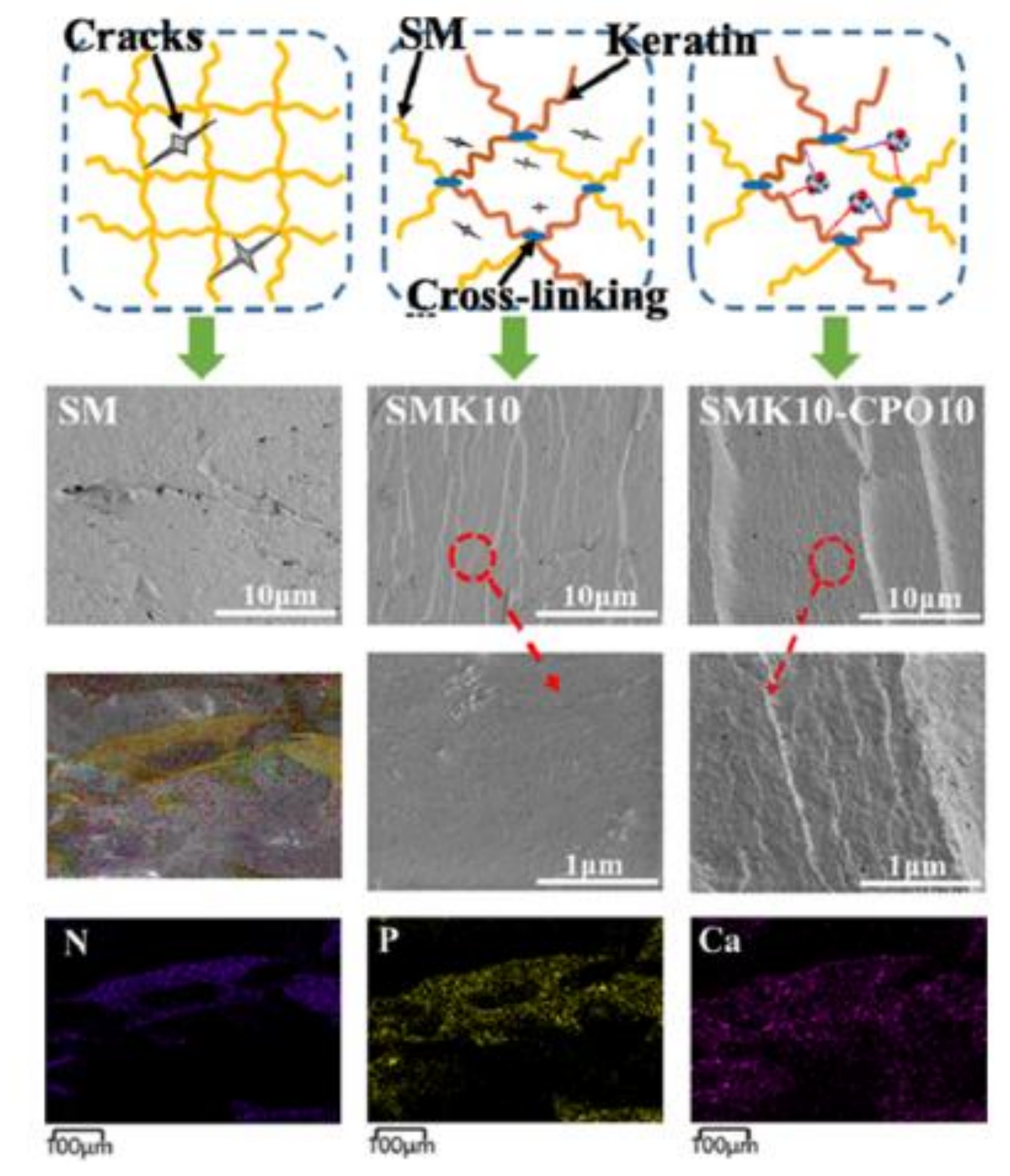
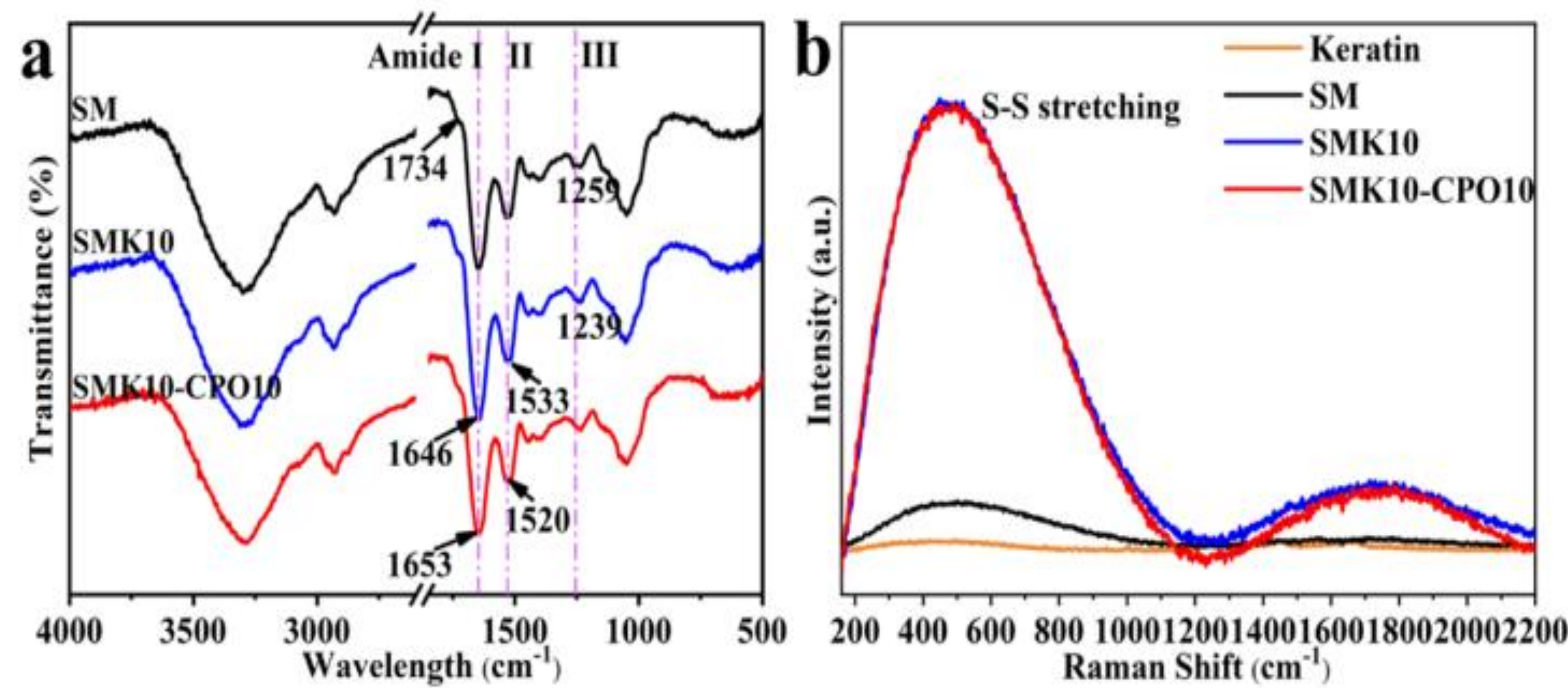


Table 2. Temperature of the Maximum Degradation Rate and Residue Weight Fraction for Different Cured Adhesive Samples

| samples     | $T_{10\%}^a$ (°C) | $T_{30\%}^a$ (°C) | $T_{50\%}^a$ (°C) | $T_{max}^b$ (°C) | residual mass (wt %) |
|-------------|-------------------|-------------------|-------------------|------------------|----------------------|
| keratin     | 219.00            | 277.95            | 309.86            | 296.22           | 18.08                |
| SM          | 243.63            | 290.14            | 345.76            | 289.61           | 31.25                |
| SMK10       | 243.71            | 288.68            | 326.12            | 298.40           | 26.51                |
| SMK10-CPO10 | 238.68            | 288.94            | 331.26            | 298.56           | 28.04                |



## summary

- A stable disulfide cross-linked homogeneous network revealed
- CPO (Calcium Phosphate Oligomer) as a precursor, plays a vital role in the combination of SM and CF
- The highest dry as well as wet strength compared to other soymeal-based works.
- The amount of chemical cross-linking agent decreased by almost half.

## Future and Acknowledgement

- Reference** – Zianzhang Li. & Zhen Fang ACS Sustainable Chemistry and Engineering. 9(2021) 7630-7637