

# 3D BULK CLOSED-CELL THERMOELECTRIC FOAMS FOR STRUCTURAL ELEMENTS OF LARGE-SCALE ENERGY HARVESTING SYSTEMS

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## Motivation

- Due to low efficiency, high cost, and poor mechanical properties, it is hard to apply thermoelectricity into large systems
- A thermoelectric composite material accompanied by structural design can provide high performance

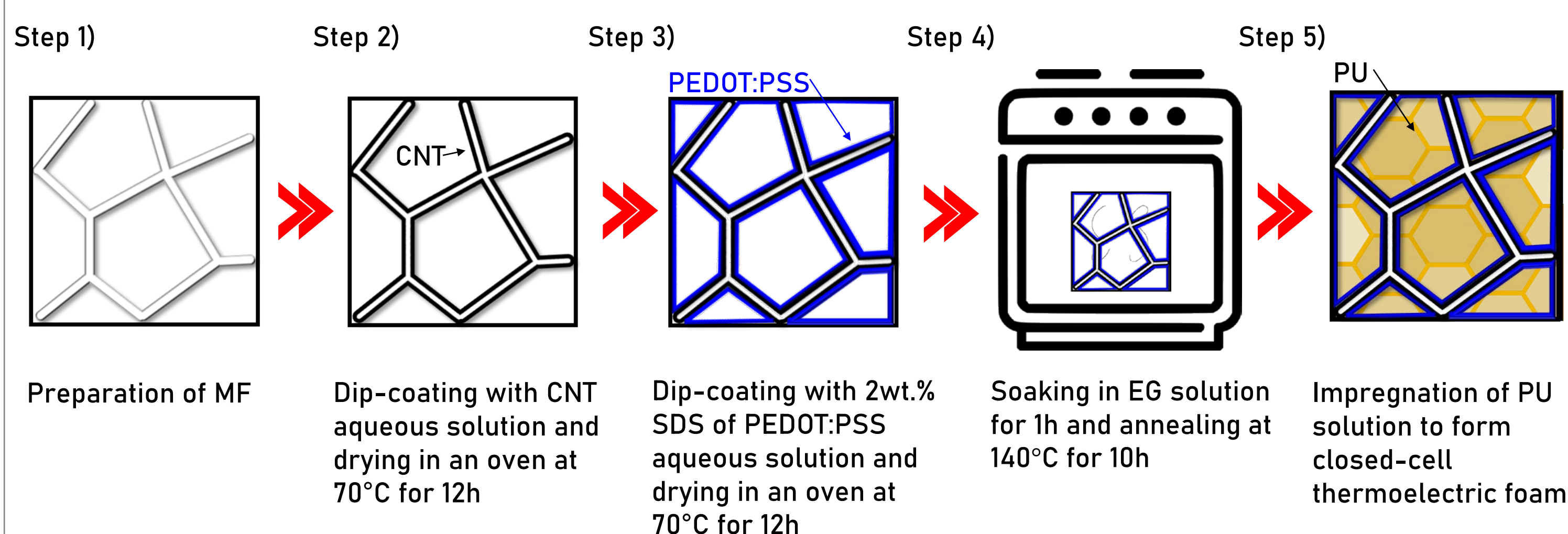
## Objective

- Fabrication of 3D bulk closed-cell thermoelectric composite foam with high thermoelectric and mechanical performance

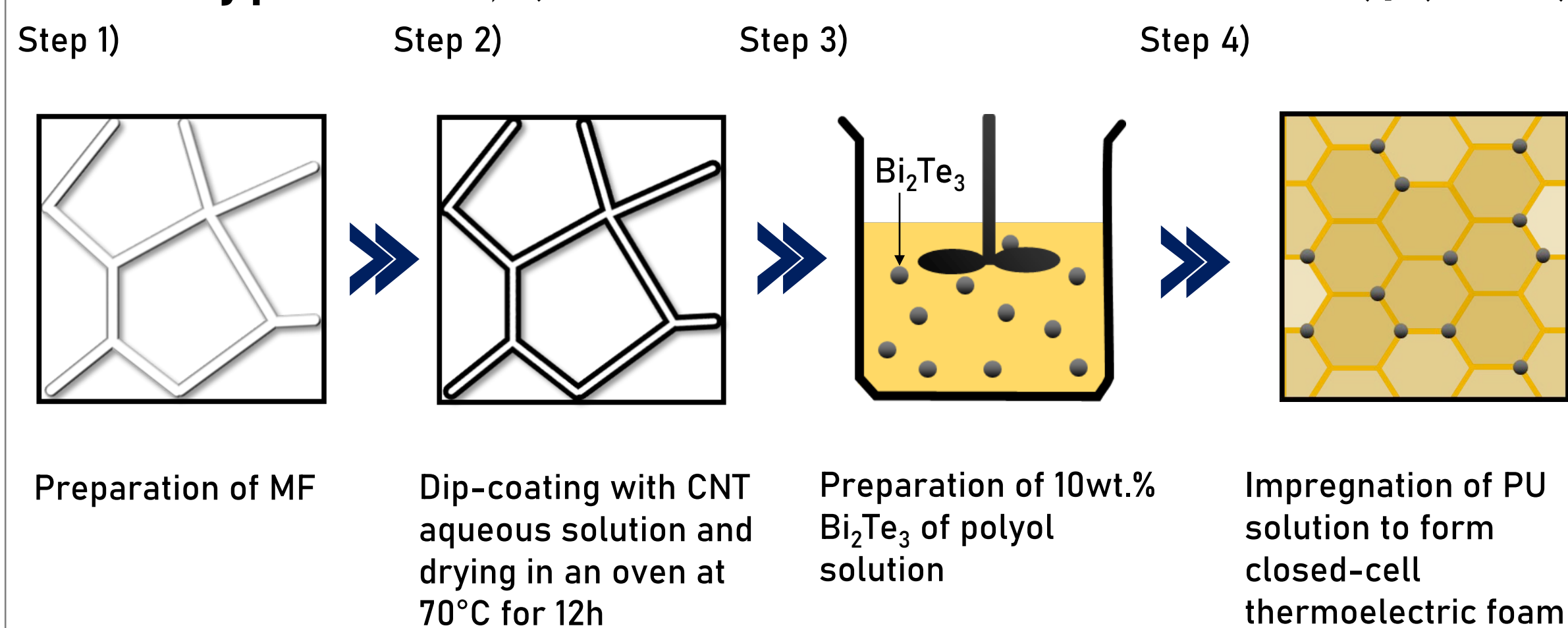
## Experiment

### Fabrication

#### ◆ P-type foam; (CNT+PEDOT:PSS coated MF)/(PUF)



#### ◆ N-type foam; (CNT+PEDOT:PSS coated MF)/(PUF)



#### Cf. Impregnation of PU solution assisted by vacuum

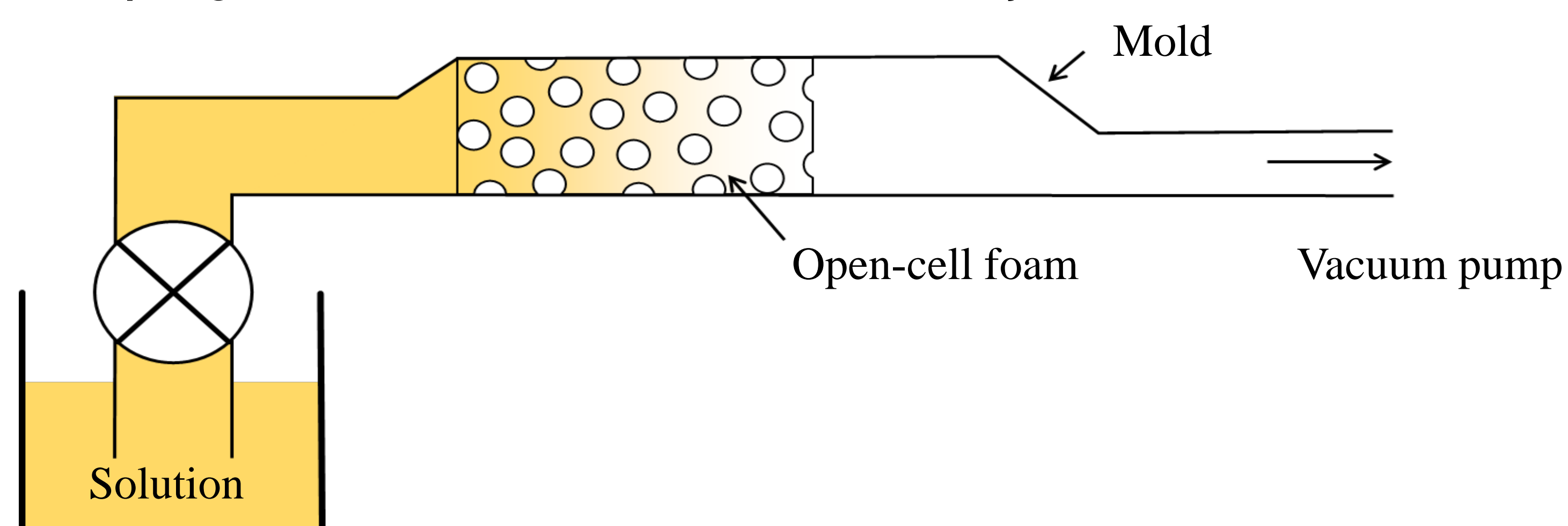
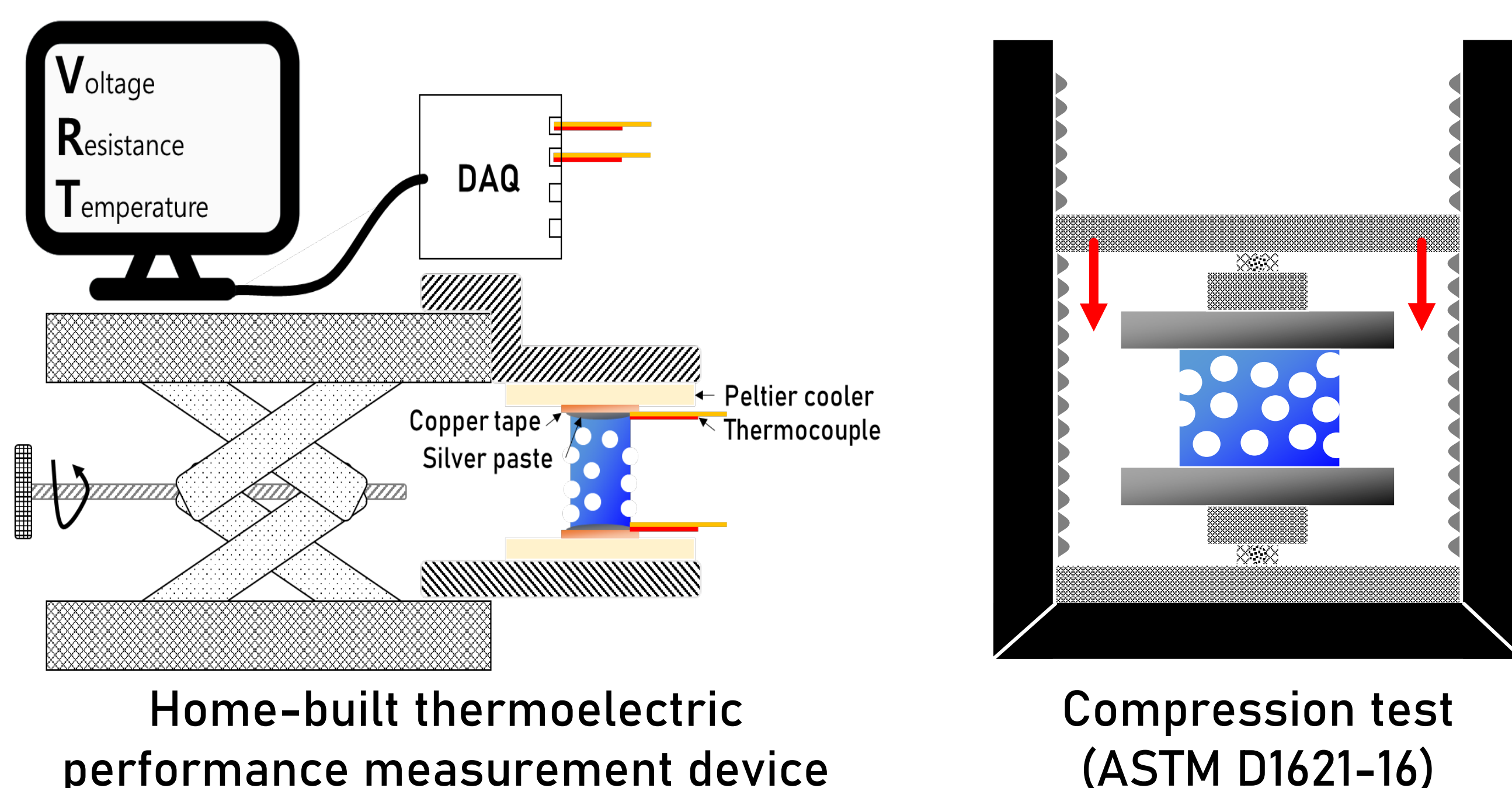


Table 1. Composition of the polyurethane solution

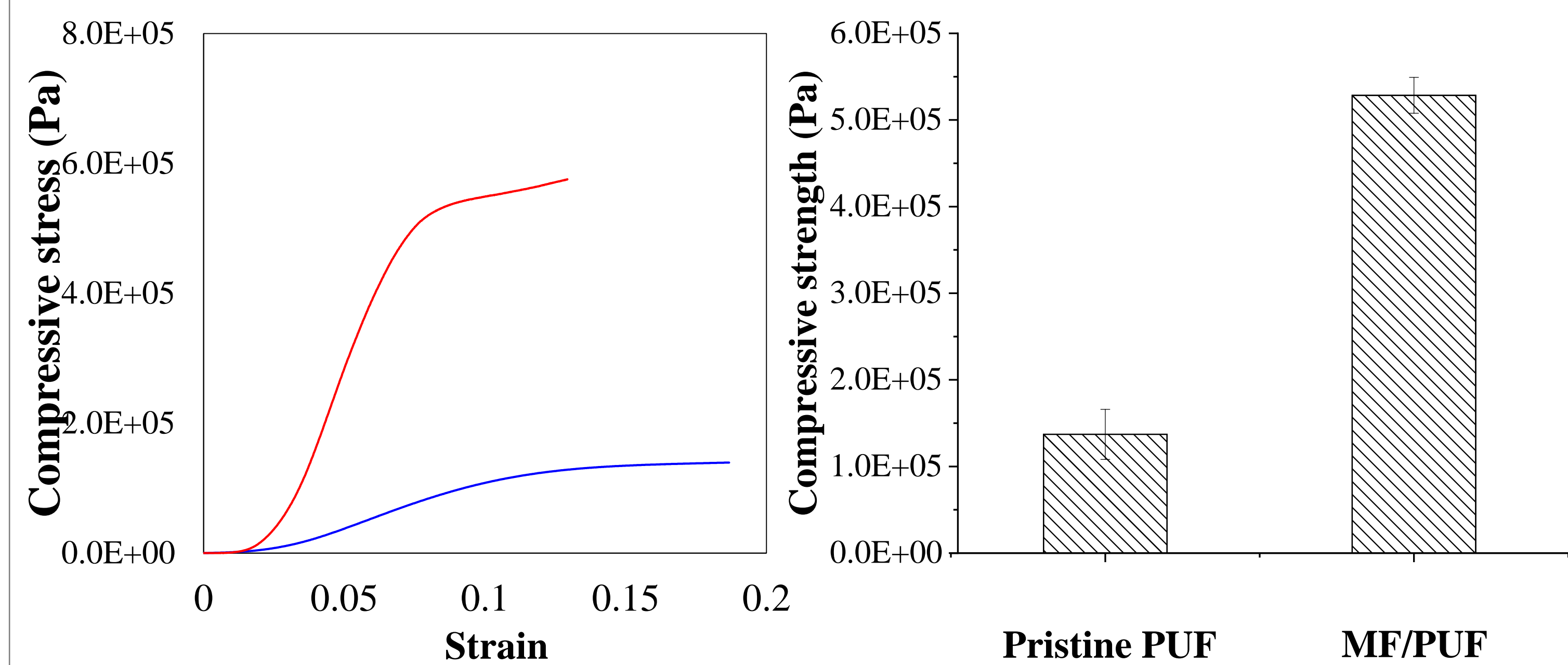
Material	Ester Polyol	Ether polyol	Silicone surfactant	Catalyst	Water	Isocyanate
Weight percent (%)	30.25	20.17	1.01	0.05	1.76	46.76

### Measurement

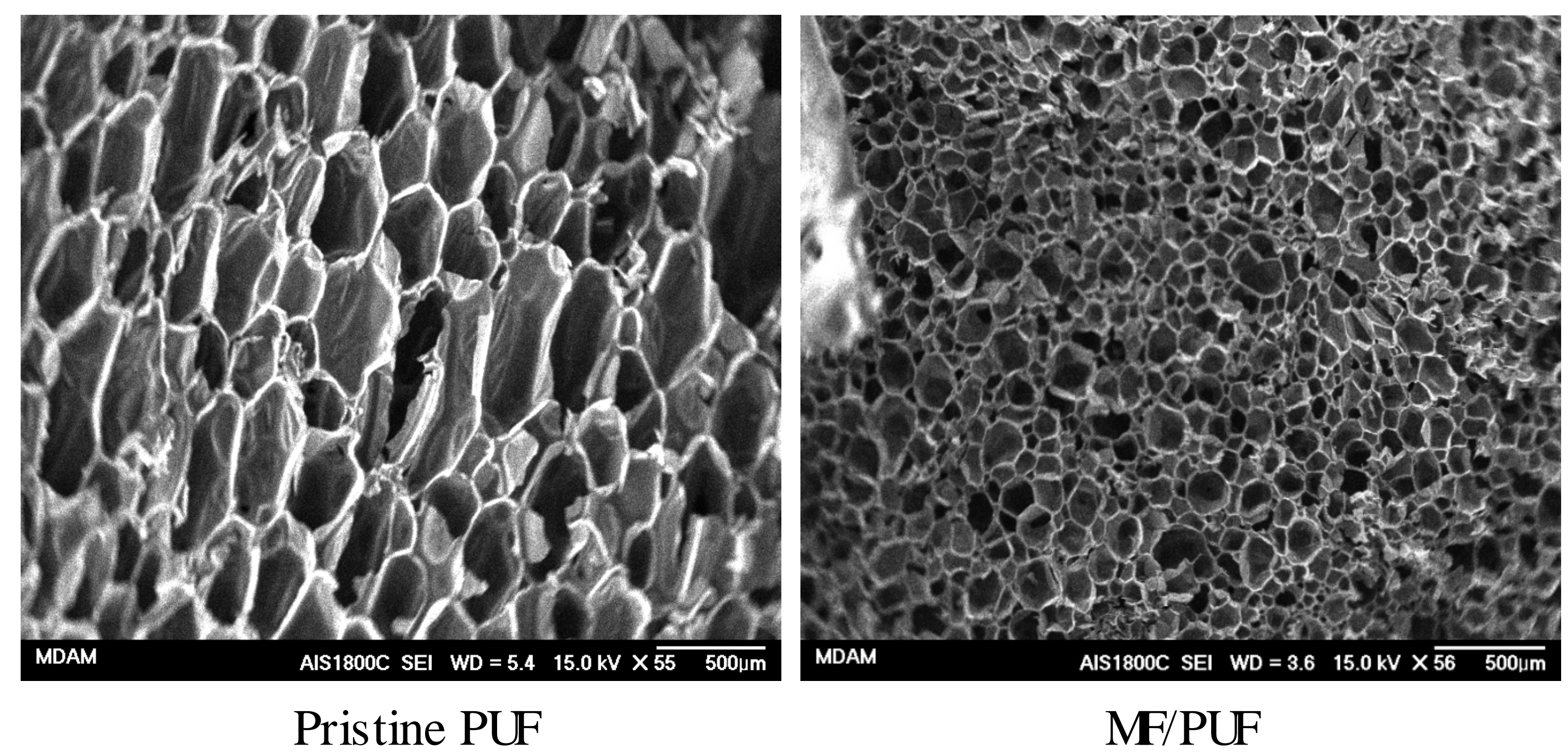


## Results

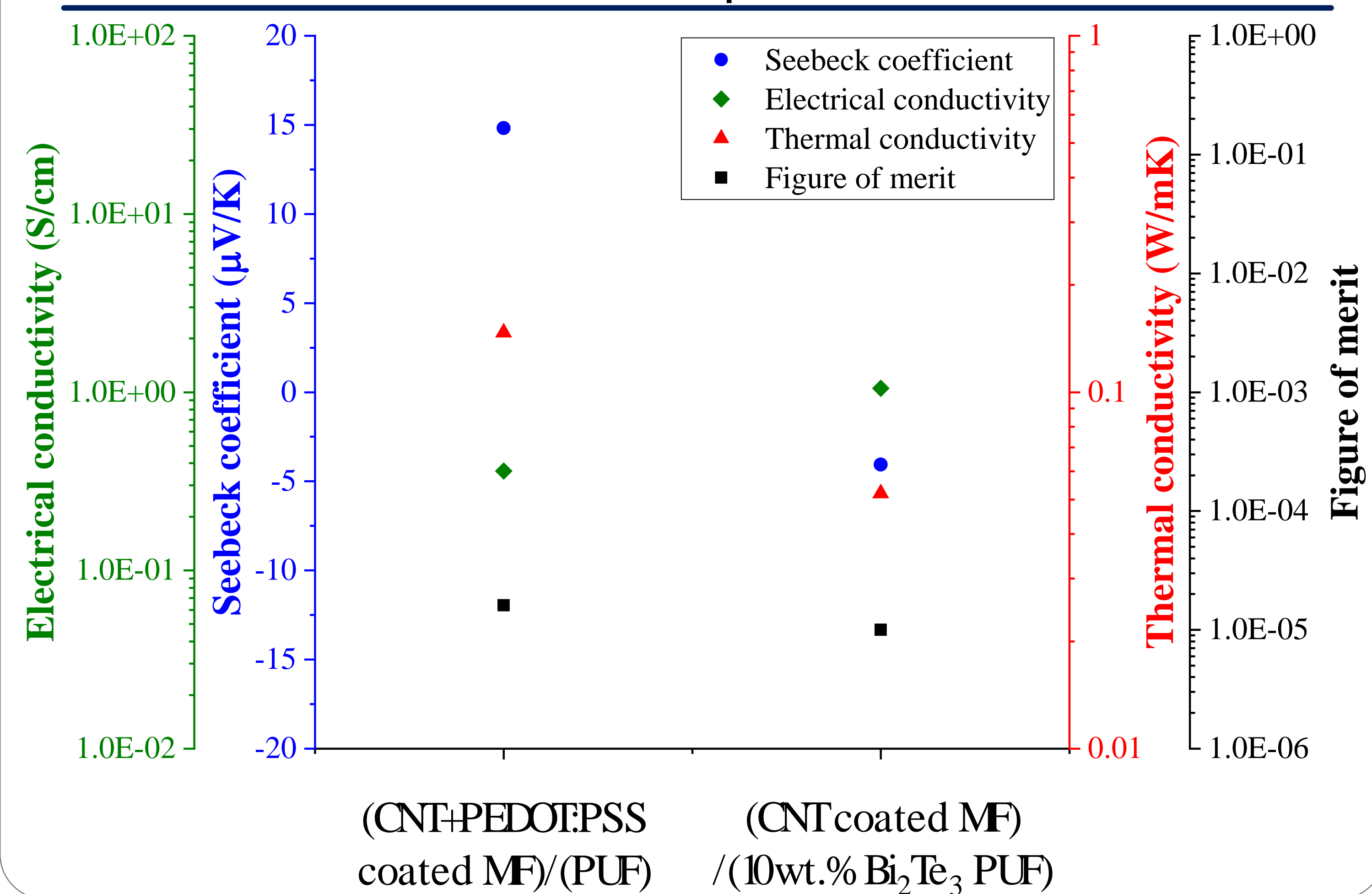
### Mechanical properties



### Cell morphology

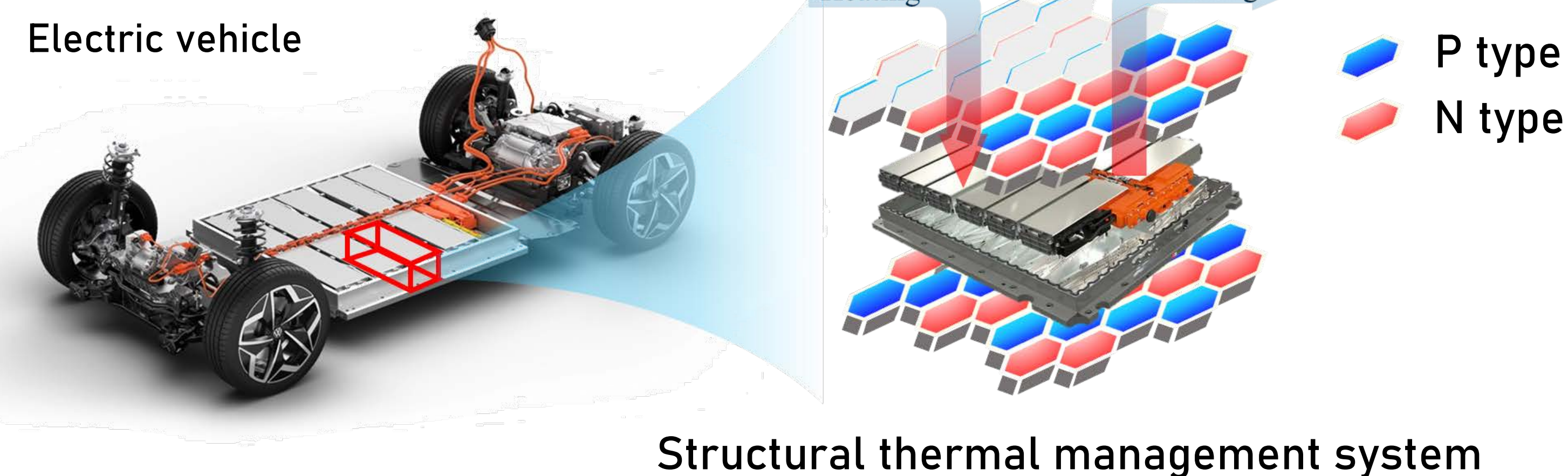


### Thermoelectric performance



## Application

### Electric vehicle



## Conclusion

- 3D bulk thermoelectric composite foam with high thermoelectric and mechanical performance for both P and N type was fabricated
- Further treatments such as acid treatment can make it to apply various system as enhancing its performance