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Flexible free-standing composite films including skeleton-structures of hollow graphene ellipsoids

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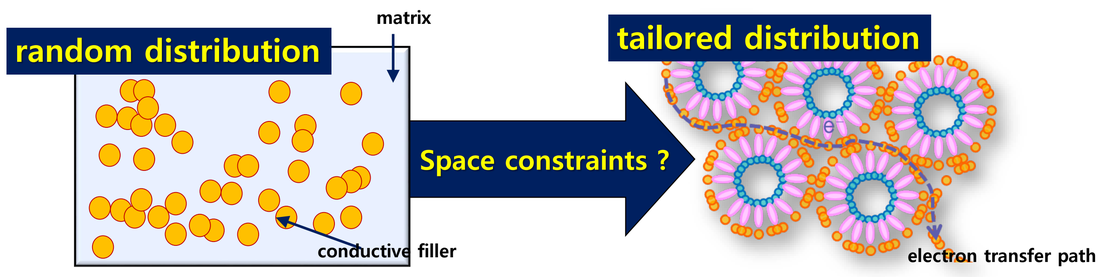
Introduction

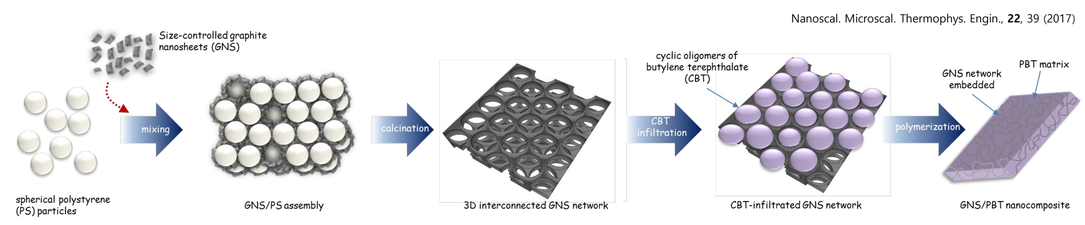
Why 3D interconnected framework ?



Problem
- Poor contacts
- High filler contents

Advantages
- Better contacts
- Lower filler contents

Strategy



Fabrication of conductive hybrid with lower loading of filler through

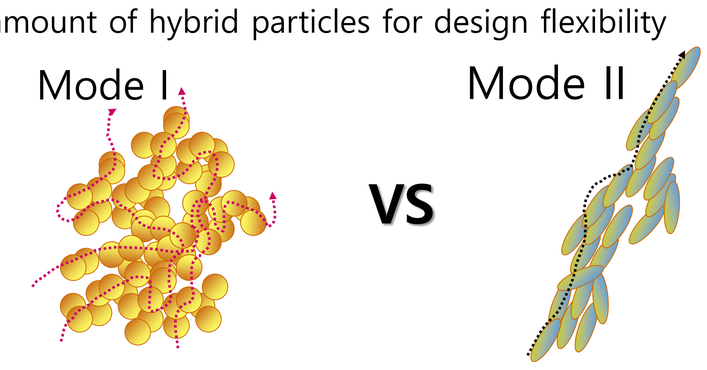
1. conductive pathway imparted by 3-D interconnected framework, and
2. few layer graphite nanosheets (GNS) with less amount of defects

Objectives

Shape-control for conduction control

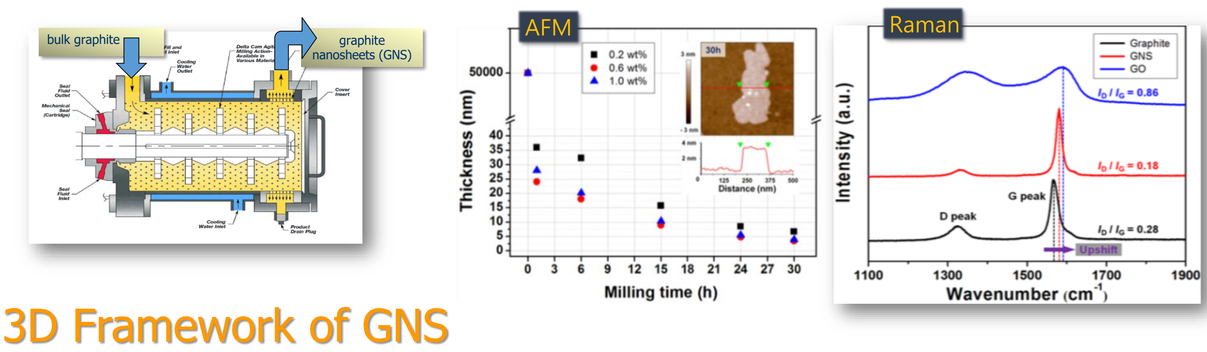
✓ Tailored assembly of non-spherical particles

- Non-spherical NPs with tailored assembly for effective conduction pathway with suppression of strayed electron transport
- Lesser amount of hybrid particles for design flexibility

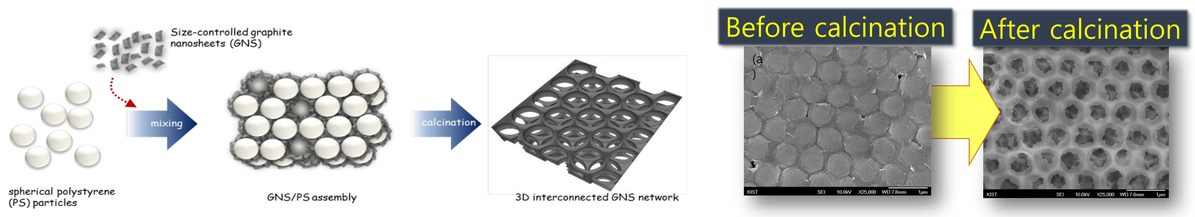


Experimental

Mechanical milling of graphite to size-controlled GNS

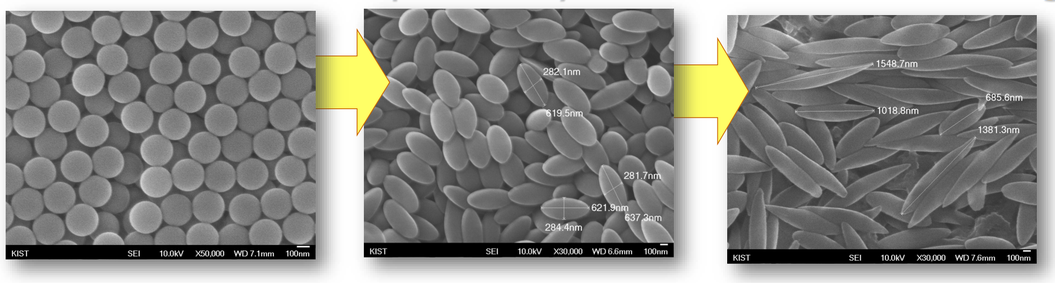


3D Framework of GNS

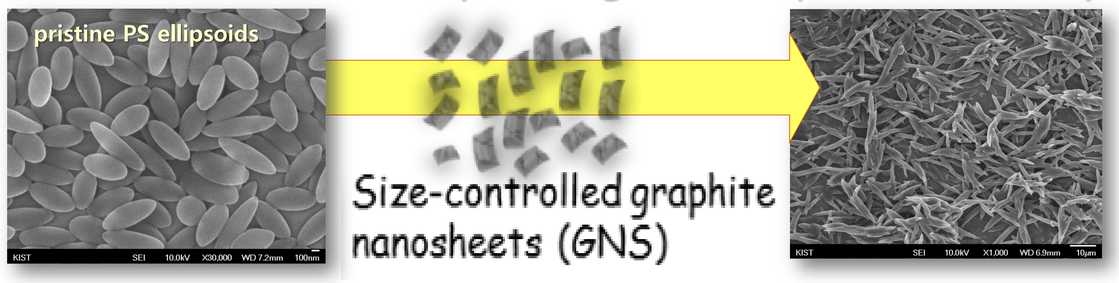


Results and Discussion

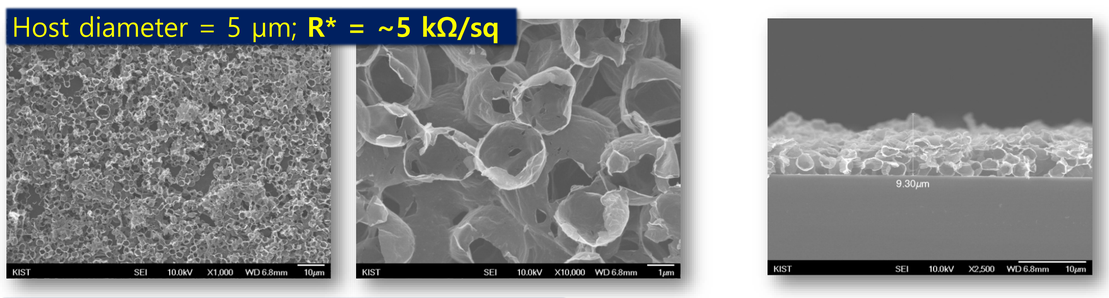
Fabrication of PS Ellipsoids by Mechano-thermal Elongation



3D Framework of GNS by mixing with Ellipsoid Assembly

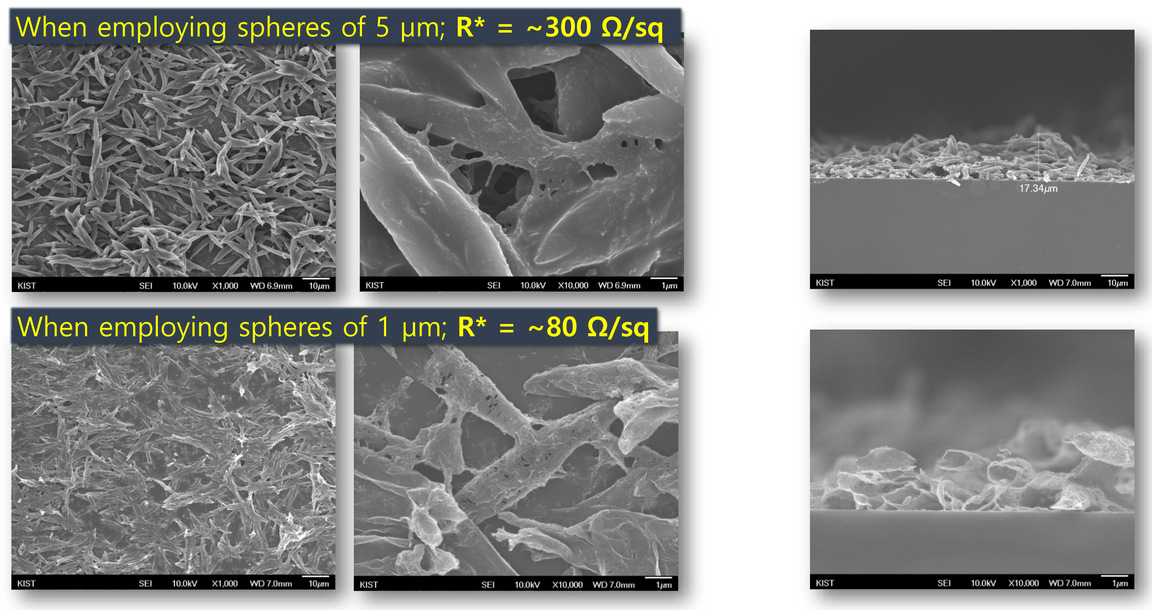


Electrical conductivity of 3D Framework based on Spheroids

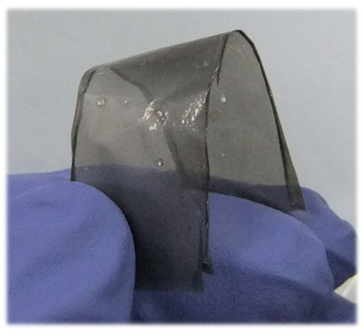


*measured by four-probe method at 25 ℃

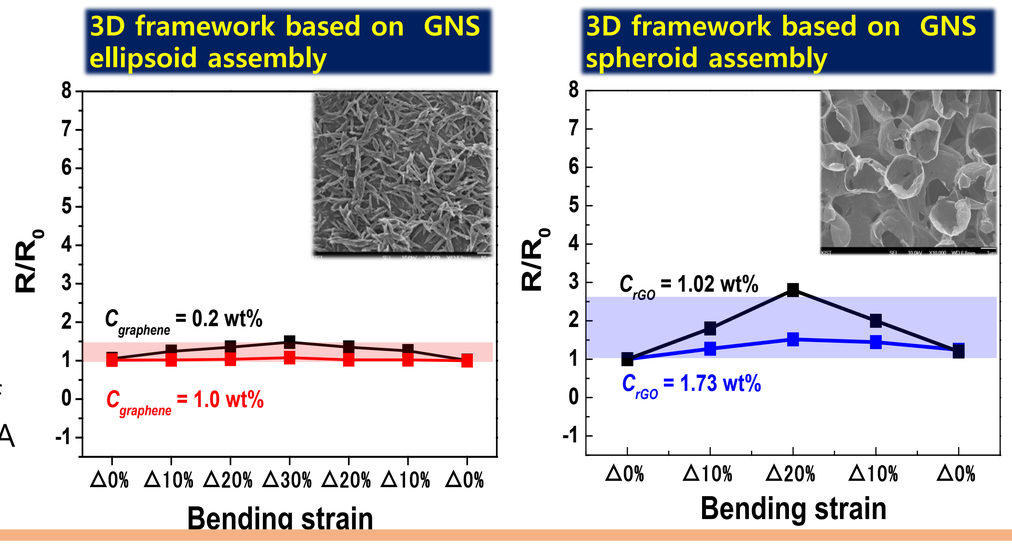
Electrical conductivity of 3D Framework based on Ellipsoids



Conductivity Changes under Deformation



Excellent deformability of the composite film of PVA and GNS framework



- The GNS ellipsoid assembly-based 3-D framework exhibited **lower resistance change** than the typical spheroid-based case.
- 3D framework with higher amount of GNS showed less change of resistance under mechanical deformation.

Conclusion

Tailored 3D framework-embedded composite

❑ Tailored 3D framework architectures possess porous structure with efficient electron transfer pathway
❑ Simple and cost-effective.
❑ Capable of mixing with various polymers (even flexible..)

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