

## Thin Graphene Oxide - Ag Foil with Hydrophobic Properties

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### Introduction

Surface properties of Graphene Oxide (GO)

Graphene oxide (GO), the functionalized graphene with oxygenated groups (mainly epoxy and hydroxyl), GO is used as an important raw material for mass production of graphene via reduction. Arrangements of oxygen-containing groups in GO can be varied, which give rise to excellent and controllable physical properties, such as tunable electronic and mechanical properties depending closely on oxidation degree, suppressed thermal conductivity, optical transparency and fluorescence, and nonlinear optical properties. Graphene oxide nanosheets are hydrophilic in nature and are not dispersible in organic solvents.

### Graphene Oxide Applications

**Electronics**  
field effect transistor, chemical sensors, biosensors, light emitting diodes (LEDs) and solar cell devices

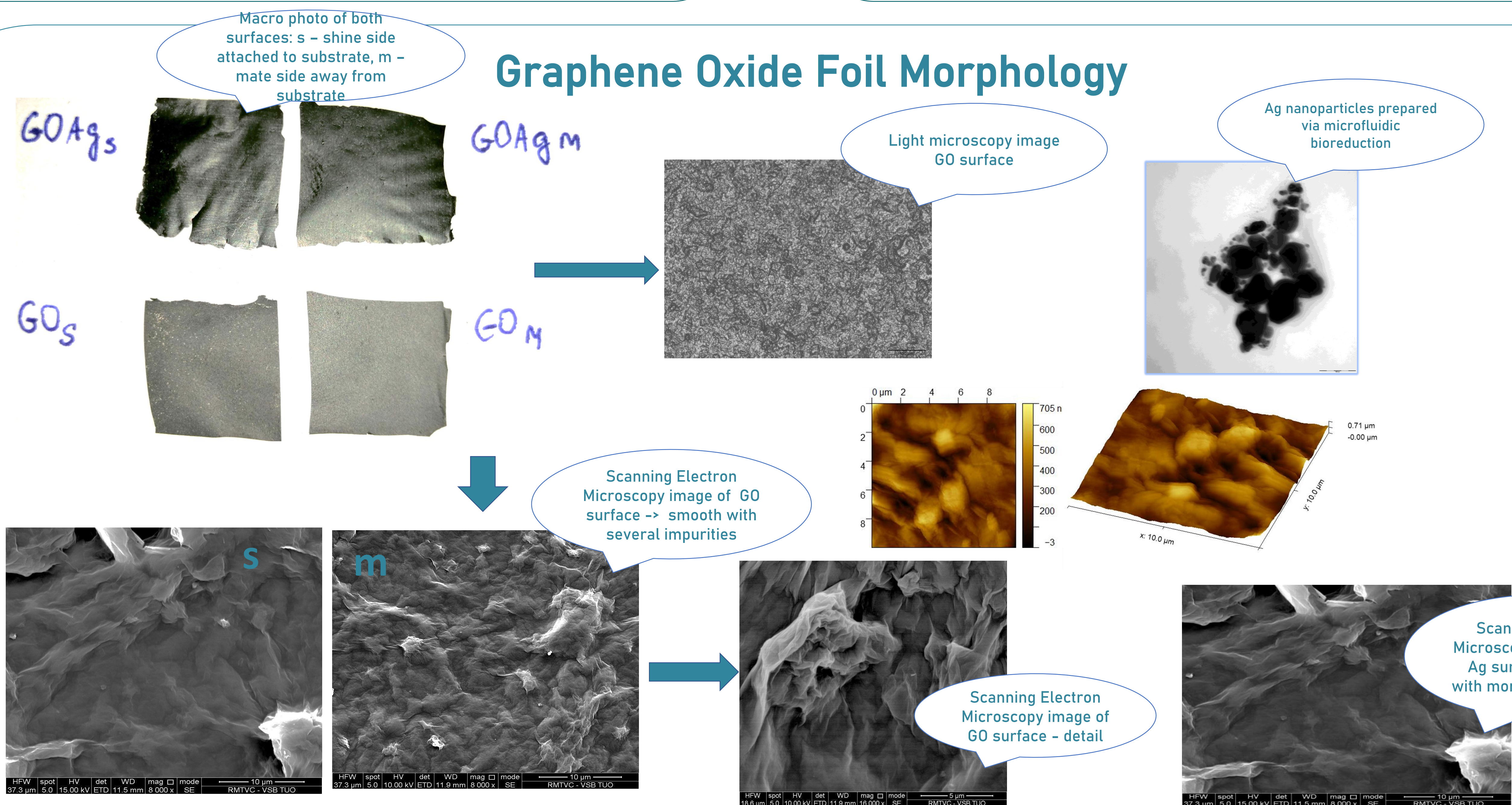
**Energy Storage**  
lithium ion batteries, supercapacitors

**Biomedical Applications**  
drug delivery systems, targeted delivery of anti-cancer drugs

**Biosensors**  
detect human cancer

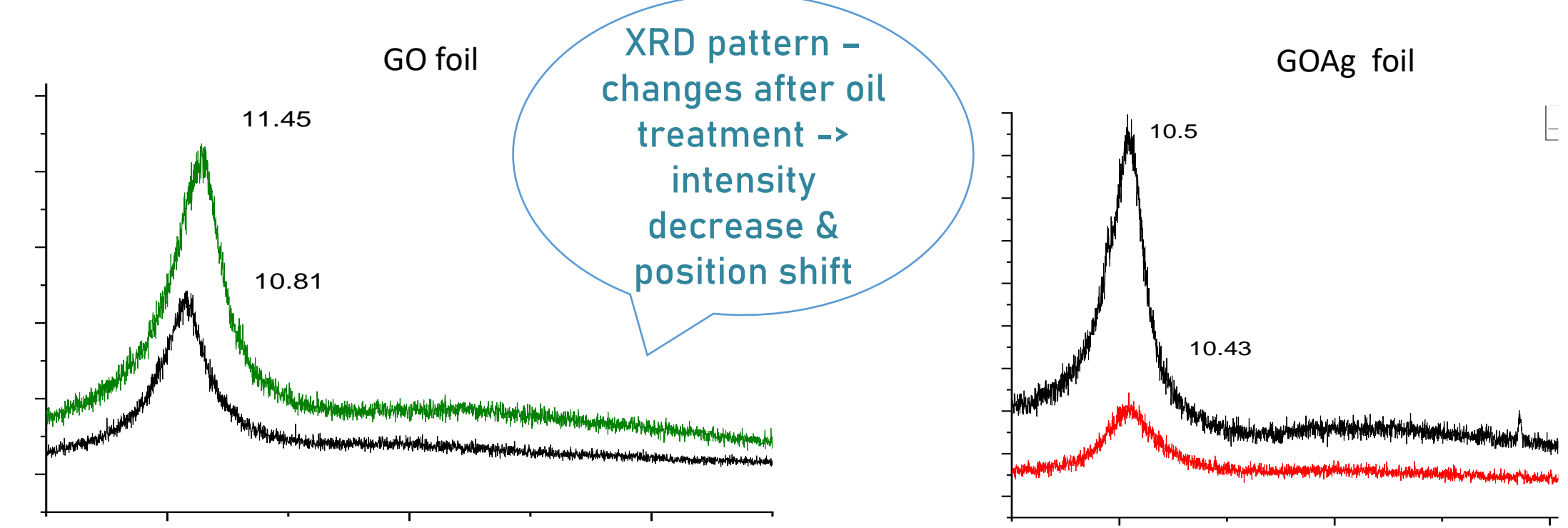
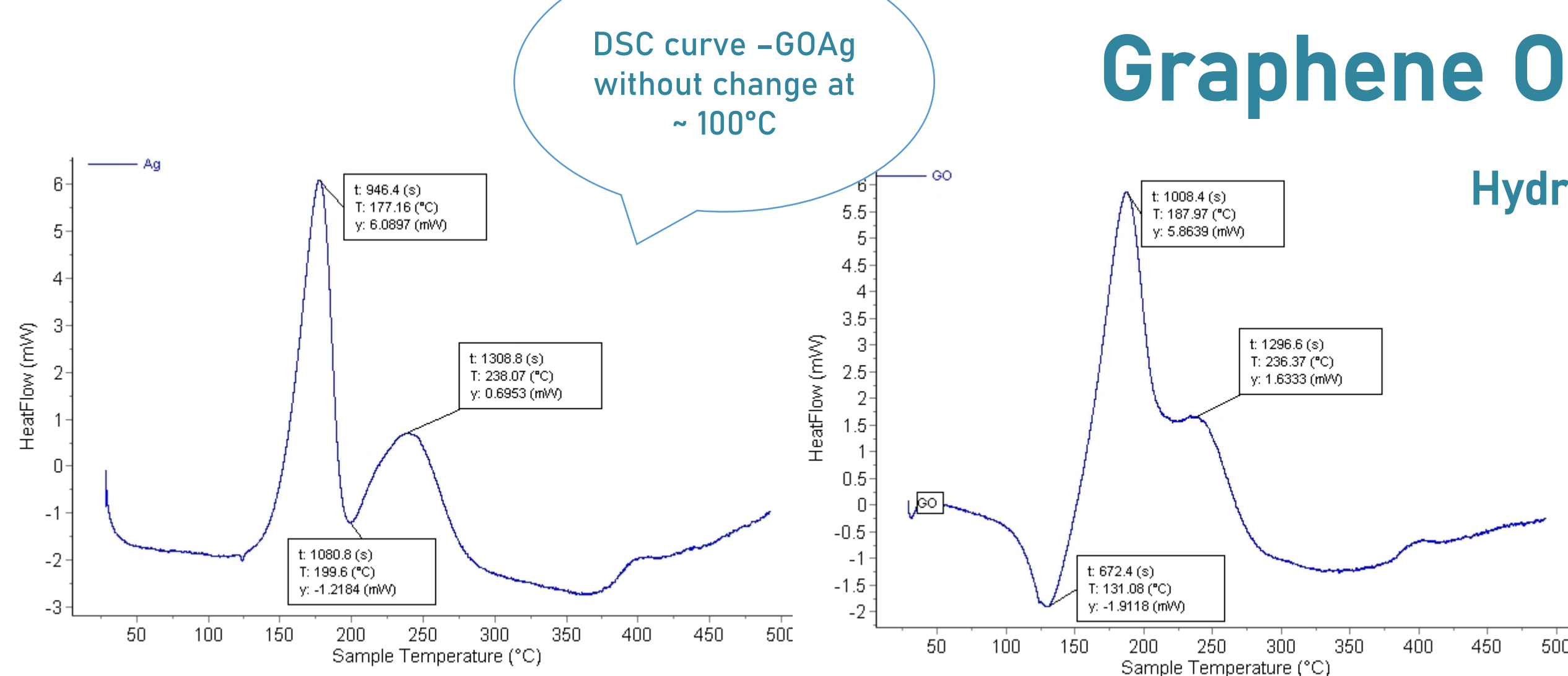
**Other**  
Graphene/polymer composite materials  
Support for metallic catalysts  
Low permeability materials  
Multifunctional materials

## Graphene Oxide Foil Morphology



## Graphene Oxide Foil Structure

Hydro-phobicity - phility properties



### Foil technology

- ❖ Hummers method graphite exfoliation -> acidic concentrated GO dispersion (3.8 pH, 100mm, 1.08 g.cm<sup>3</sup>)
- ❖ Microfluidic reduction of ionic Ag via phytosynthesis (thilia cordata, silver nitride)
- ❖ Mixture of GO suspension and Ag colloid -> sonication
- ❖ pure Graphene Oxide (GO) foil casting on non-adhesive surface (6.5 cm<sup>2</sup>, 3 ml)
- ❖ Ag - Modified GO foil casting (6.5 cm<sup>2</sup>, 3 ml)

### Conclusion

- ❖ GO foil contains more water molecules and is hydrophilic
- ❖ GOAg foil is more firm and hydrophobic
- ❖ GOAg structure treated with organic oil is degraded

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