

**On-demand controllable  
properties of mesoporous carbon  
powders named “CNovel™”**

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# Company's outline



## Toyo Tanso Co., Ltd.

- Pioneer of graphite products

### Head Office

- Osaka City

### Production Bases

- Kagawa Pref.

### Overseas Offices

- USA

- Italy

- France

- Germany (Langgöns)

and so on...



# Main products

## Special Graphite Products

Excellent properties

- Heat resistance
- Chemical resistance
- Thermal conductivity



[For Semiconductor/Solar Cell]



[For Metallurgical]



[For Electric discharge machining]



[For Atomic Power]

## Compound materials and other products

C/C composite

- Shock resistance

Graphite sheets

- Flexibility
- Thermal conductivity



[For Semiconductor/Aerospace]



[For Packing/Gaskets]

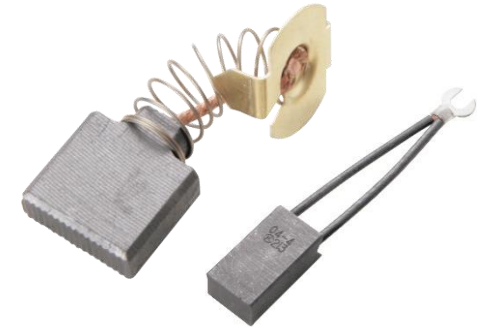
# Main products

## Carbon products for general industries

- Self lubricating
- Heat resistance
- Chemical resistance



[Seal Ring/Bearing]



[Brushes]



# New Development



## CNovel

### Porous carbon powder

- High mesoporosity
- Large surface area
- Inter-connected pore structure

## EVEREDKOTE

### TaC coated graphite

- Wear resistance
- Corrosion resistance
- Dust-prevention



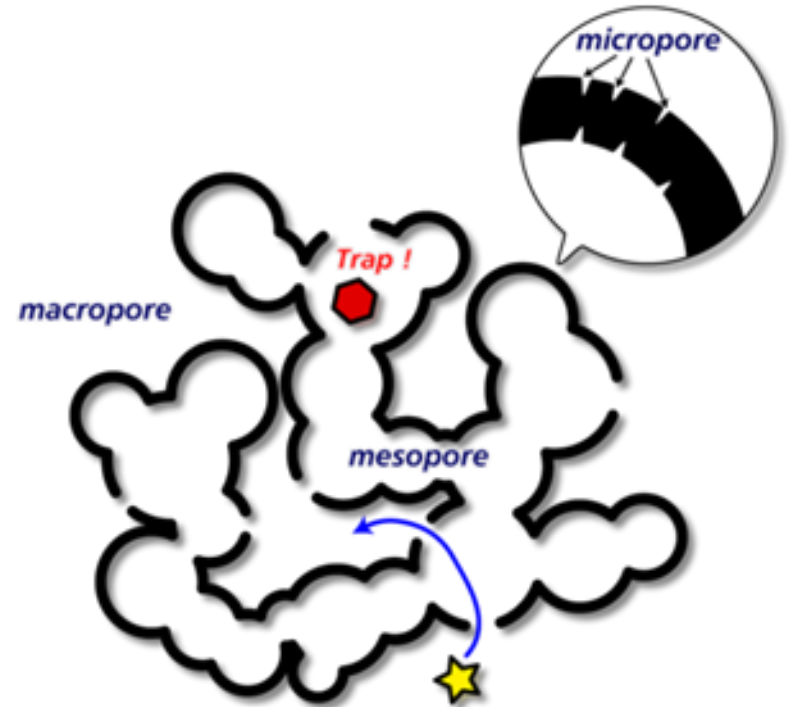
# What's "CNovel™"?

## CNovel™

### Meso porous carbon powder

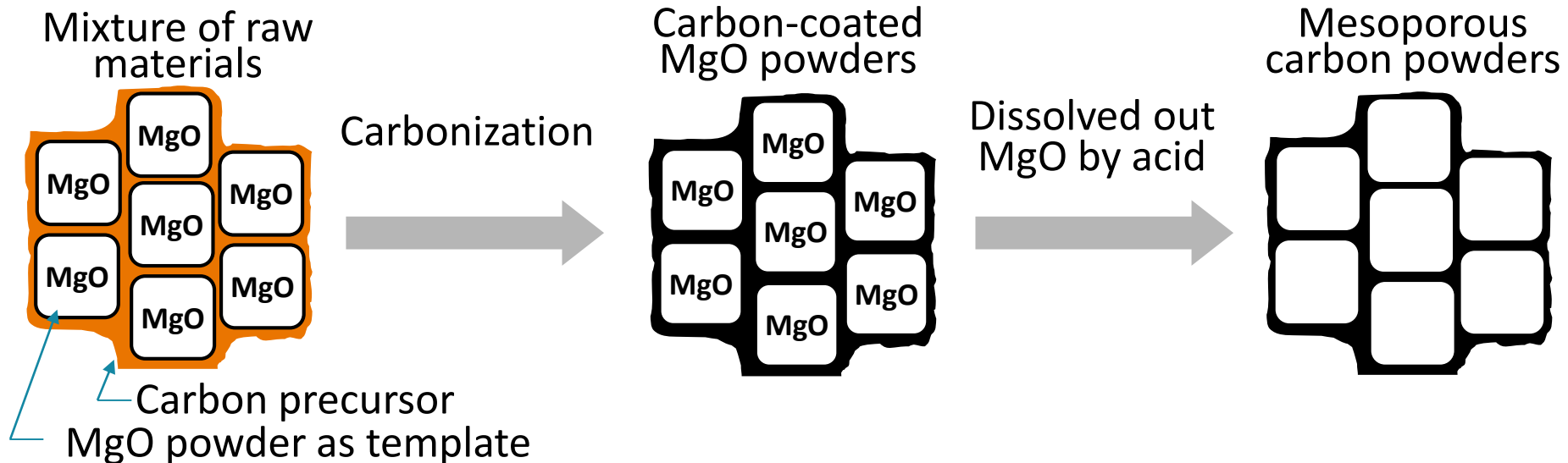
- High mesoporosity
- Large surface area
- Inter-connected pore structure
- Controllable meso pore size

|                                     | MH grade |
|-------------------------------------|----------|
| BET surface area[m <sup>2</sup> /g] | 1500     |
| Total pore volume [ml/g]            | 1.7      |
| Meso pore volume [ml/g]             | 1.2      |
| Micro pore volume{ml/g]             | 0.5      |
| Designed pore size [nm]             | 5        |



# What's "CNovel™"?

## Manufacturing Process

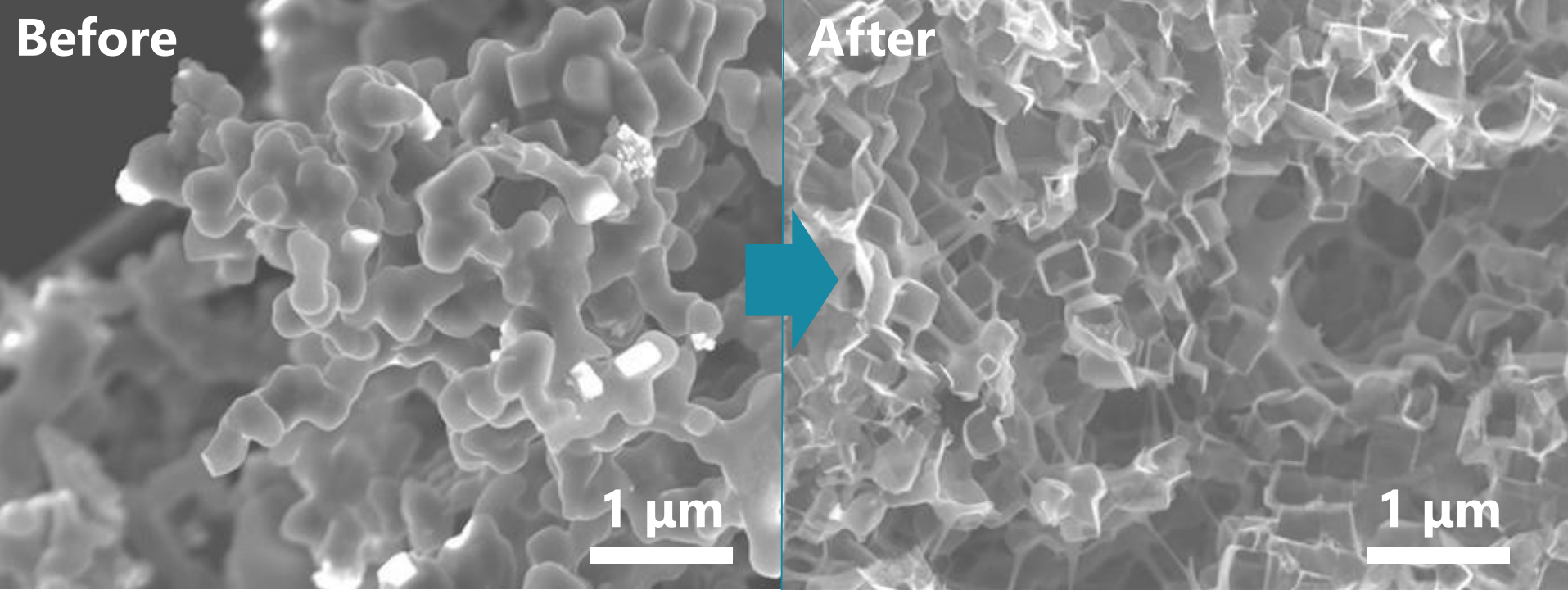


- ✓ Simple manufacturing process
- ✓ No activation process
- ✓ Controllable meso pore size (above 3.5 nm)



# What's "CNovel™"?

SEM Images  
-before and after dissolving process-



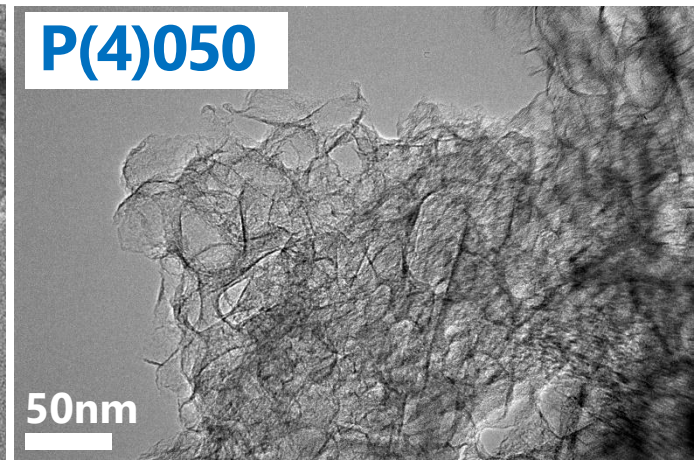
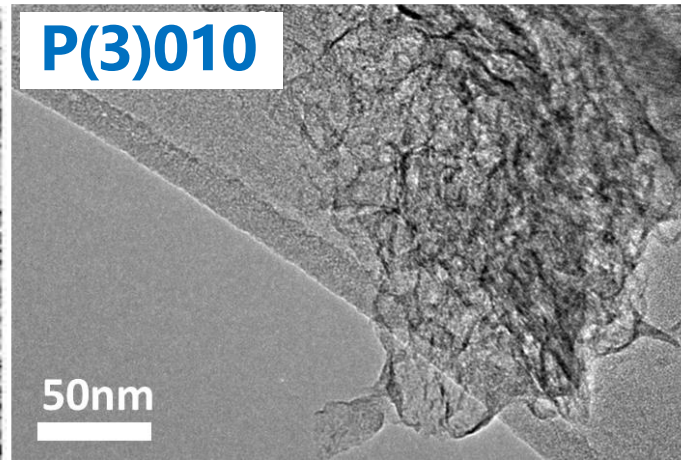
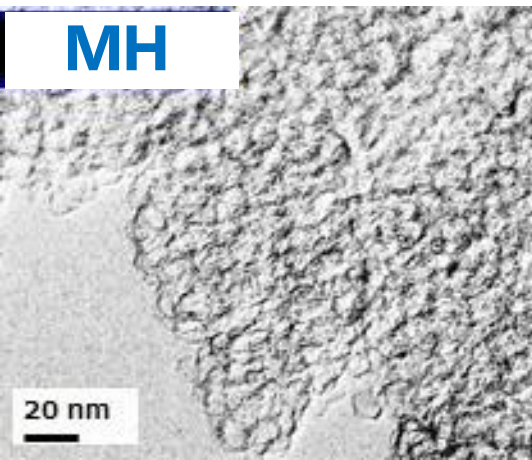
- ✓ MgO aren't completely coated by carbon
- ✓ Meso pore size depends on crystal size of MgO

# What's "CNovel™"?

## Standard Grades

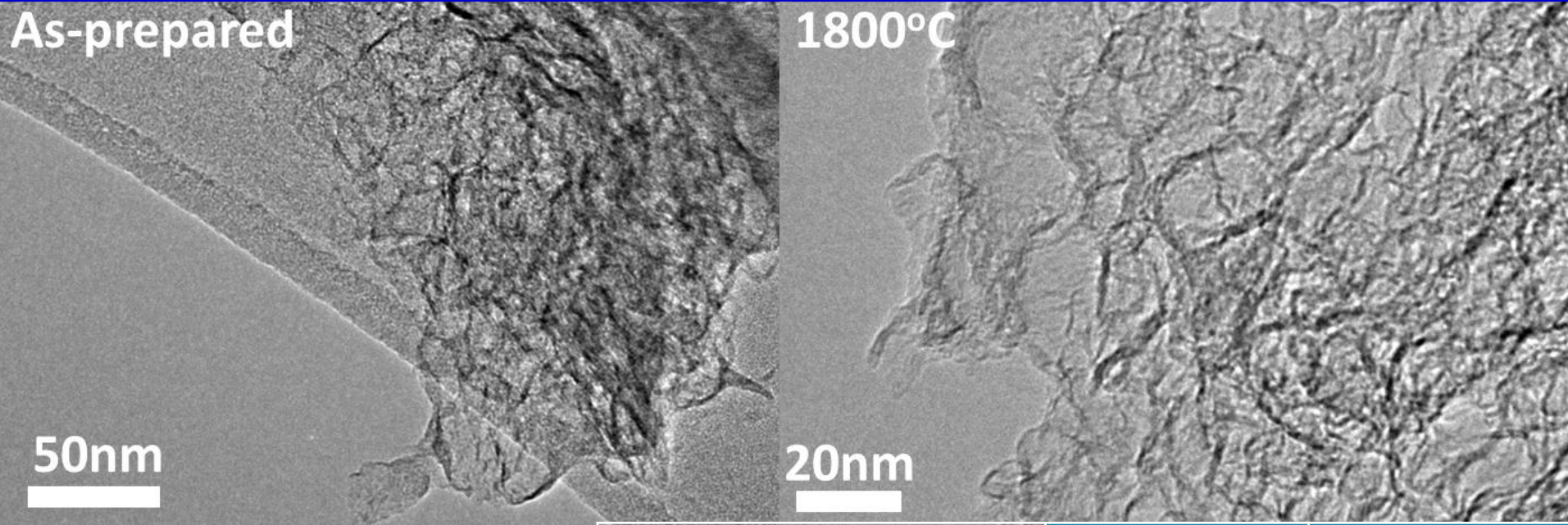
✓ 4 standard grades are available

|                                     | MH   | P(2)010 | P(3)010 | P(4)050 |
|-------------------------------------|------|---------|---------|---------|
| BET surface area[m <sup>2</sup> /g] | 1500 | 1600    | 1600    | 1000    |
| Total pore volume [ml/g]            | 1.7  | 1.5     | 3.0     | 1.5     |
| Meso pore volume [ml/g]             | 1.2  | 1.0     | 2.4     | 1.1     |
| Micro pore volume [ml/g]            | 0.5  | 0.5     | 0.6     | 0.4     |
| Designed pore size [nm]             | 5    | 10      | 10      | 50      |



# What's "CNovel™"?

## Customization -crystallinity-



- ✓ Crystallinity has grown by heat-treatment.
- ✓ Meso pore structure doesn't change.

|                                     | As-prepared | 1800°C-HT |
|-------------------------------------|-------------|-----------|
| BET surface area[m <sup>2</sup> /g] | 1200        | 870       |
| Total pore volume [ml/g]            | 2.15        | 1.99      |
| Meso pore volume [ml/g]             | 1.70        | 1.67      |
| Micro pore volume [ml/g]            | 0.45        | 0.33      |
| Designed pore size [nm]             | 11          | 11        |

# What's "CNovel™"?

## Summary

### CNovel™

#### Meso porous carbon powder

- ✓ Meso rich and inter-connected pore structure
- ✓ 4 standard grades are available
- ✓ Parameters as shown below are customizable
  - pore size, crystallinity, surface state, and so on...

**We offer suitable CNovel to customer needs.**

