

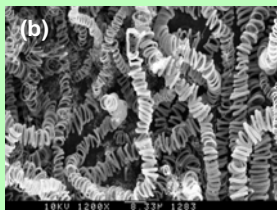
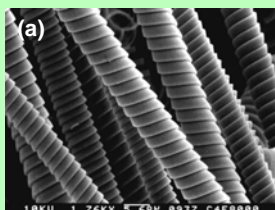
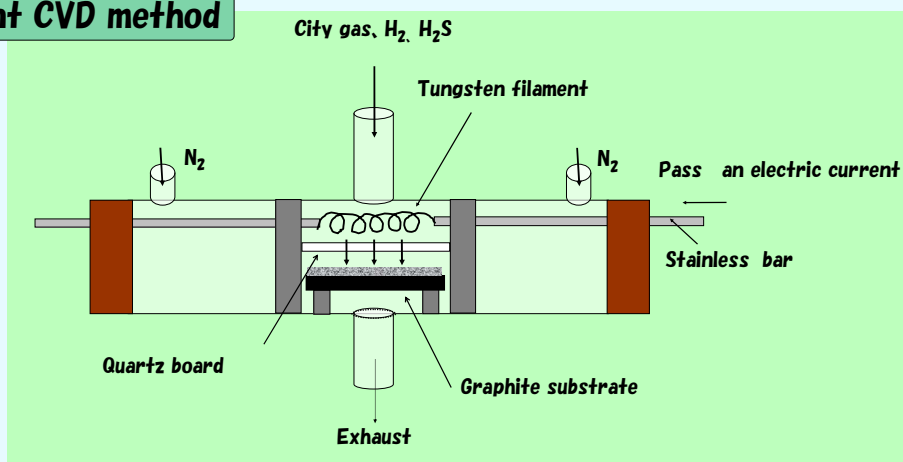
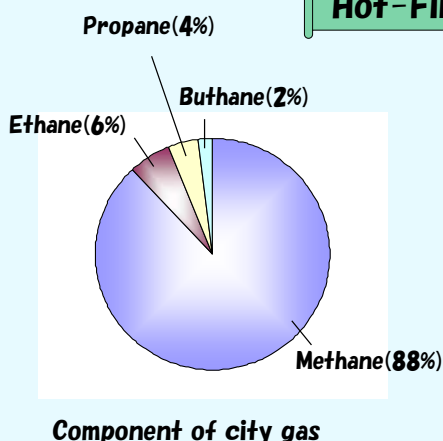
# Vapor phase preparation of carbon microcoils (CMCs) using city gas

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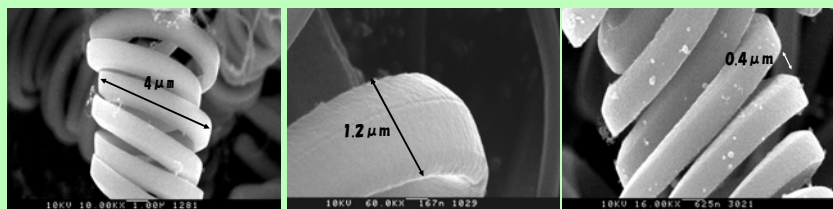
Carbon microcoils (CMCs) are prepared by chemical vapor deposition (CVD) method using Ni as a catalyst and have an interesting 3D-helical/spiral structure with a coil diameter of micrometer orders. Since CMCs have various special characteristics such as electromagnetic wave absorption and electrical characteristic, CMC have been used in cosmetics or tactile sensors. But CMCs are expensive and it is difficult to be applied in diverse fields. So, in this work, we attempted to use city gas as raw materials that cost a tenth of acetylene gas used as before.

City gas is thermally decomposed at above 1300°C. ➔ We synthesized CMCs using city gas by Hot-filament CVD method. Optimum temperature for CMC growth is 770°C.

## Hot-Filament CVD method



SEM images of CMC using various gas  
 (a) Acetylene gas, (b) City gas

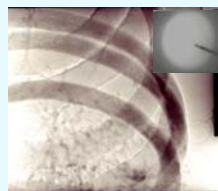


Morphology of CMC using city gas

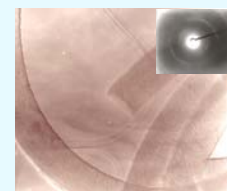
## Synthesis conditions and Results

Materials	Decomposition temperature (°C)	Reaction temperature (°C)	Yield (mg/cm <sup>2</sup> )
Acetylene	770	770	10~20
City gas	1300	770	2

## TEM Observation

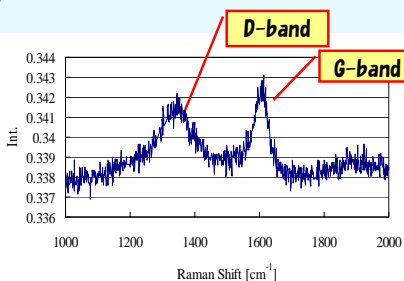


As grown CMC

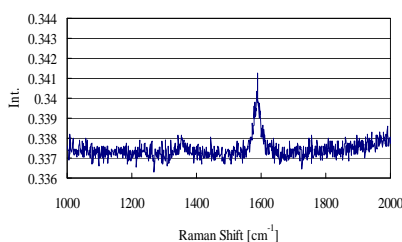


Heat treated CMC at 2500°C for 4h

## Raman Spectrum



As grown CMC



Heat treated CMC at 2500°C for 4h

## Conclusion

- We succeeded to synthesize CMCs using City gas as raw materials.
- CMCs have large coil gap and indicate good elastic property.
- CMCs are composed of amorphous carbon and were graphitized after heat-treated at 2500°C for 4h under Ar atmosphere.