Dispersion and purification of CMCs

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Abstract

Carbon microcoils (CMCs) possess a three-dimensional (3D) structure and certain unique properties. CMCs are expected to have novel functionalities and many applications. CMCs have some dispersing problems when using as composited materials. Carbon fibers and carbon dust mix together with CMCs in CVD products. Removing them from CMCs is very difficult. It is also difficult in dispersion because CMCs are twining each other due to CMCs' spring structure. For solving these problems, we studied CMC purification using Sodium lauryl sulfate (SDS) solution (a kind of surface-active agents) and CMC dispersion using organic solvents.

Purification

	SDS(g)	PDMA(g)
A	0.2	0.08
B	0.2	0.4
C	0.1	-
D	0.1	0.08

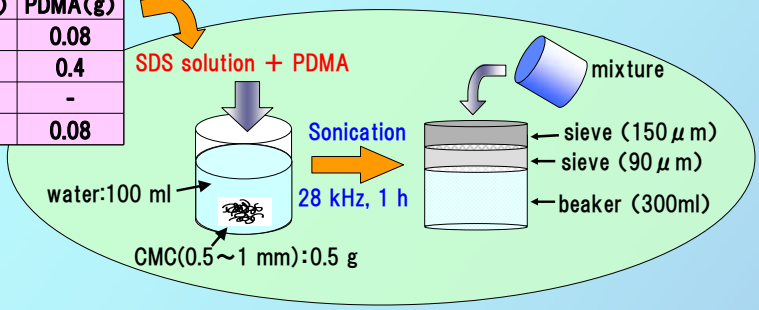


Fig. 1. Purification process

SEM images

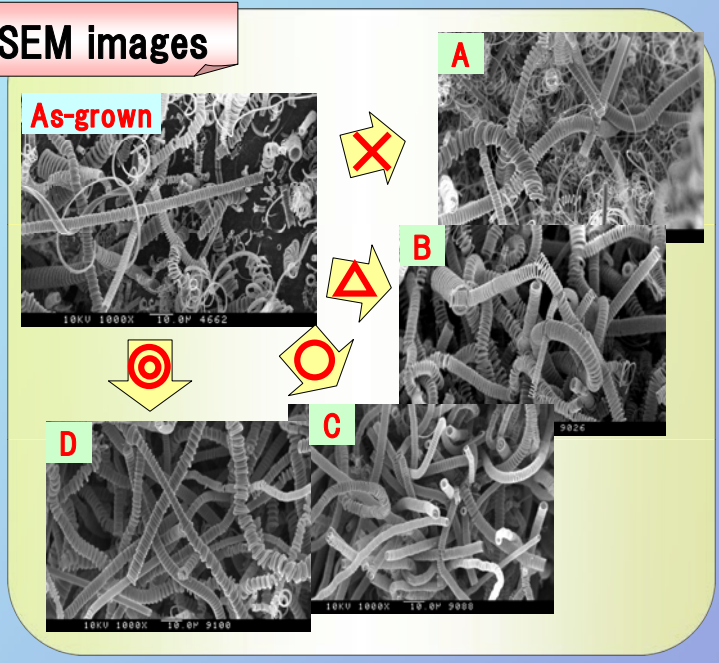
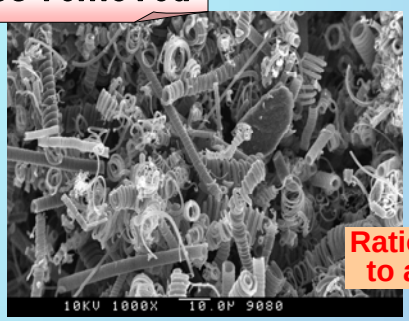


Fig. 2. SEM images of purified CMCs

Carbon species removed



Ratio of carbon species removed to as grown CMCs : 6 %

Fig. 3. SEM image of carbon species removed

Dispersion

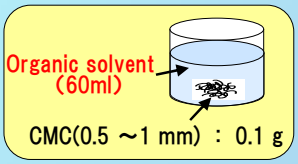


Fig. 4. Dispersion process and metallographic microscope photos of dispersion CMCs in solvents

	ethanol	1-butanol	2-puropanol	p-xylene
Viscosity coefficient (cP)	1.17	2.95	2.43	0.603

Table. 1. Viscosity coefficients of organic solvents

Absorbance of CMCs dispersion

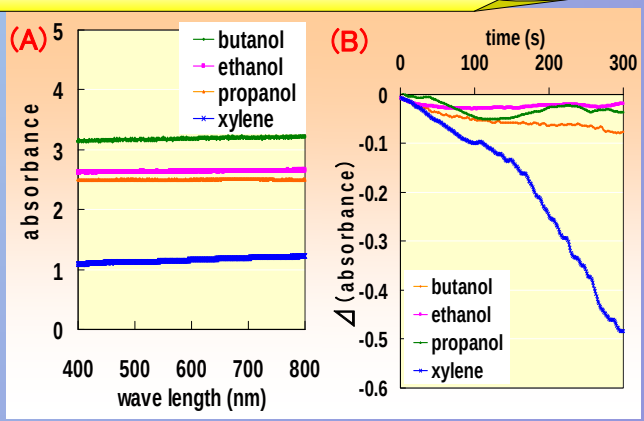


Fig. 5. Absorbance of CMCs dispersion in different solvents

Conclusion

□ Purification

- The best CMC purification condition was adding 0.1 g of SDS into 100 ml water containing 0.5 g CMCs.
- Carbon dust was almost removed from CMCs by this method.

□ Dispersion

- The absorbance of CMC/1-butanol is the highest, while CMC/p-xylene is the lowest.
- 1-butanol was the best organic solvents for dispersing CMCs; on the other hands, p-xylene was the poorest.
- The viscosity of solvent is related to the dispersion procesing.