VAMAS

Nanoparticle Populations

Technical Work Area 34

Call for Participation

Project 4

Raman Spectroscopy of Fullerene Nanofibers

Objectives

To prepare the database of internationally standardized Raman profiles of fullerene nanofibers that are composed of C_{60}.

Background

Fullerene nanofibers are defined as the fibers that are composed of fullerene molecules and have diameters less than 1000 nm. They can take both the non-tubular and tubular morphologies. The non-tubular fullerene nanofiber with single crystalline structure is called fullerene nanowhisker, while the tubular fullerene nanofiber is called fullerene nanotube.

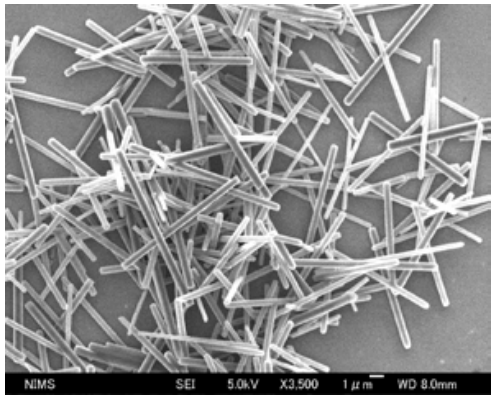
The fullerene nanofibers are the new semiconducting materials that are applicable to solar cells, templates for chemical synthesis, MEMS cantilever beams, field-effect transistors, catalysts, composite fillers and so on.

The first synthesis of C_{60} nanowhiskers was performed by the liquid-liquid interfacial precipitation method (LLIP method) in 2001 [1,2]. Next, the synthesis of single crystalline C_{70} nanotubes and C_{60}-C_{70} two-component nanotubes were successfully performed by the LLIP method [3]. The LLIP method is the first established method to fabricate the single crystalline fullerene nanotubes. Further, C_{60} monocomponent nanotubes were synthesized by the LLIP method [4].

Standardization Needs

The researcher population of fullerene nanofibers are small at the present time. However, it is gradually increasing, and will increase more with the decreasing price of fullerenes.

Hence, the pre-standardization is necessary for future popularization of fullerene nanofibers.



Work Programme

1. The C_{60} nanofibers with non-tubular and single crystalline structure (C_{60} nanowhiskers) will be supplied by the National Institute of Materials Science (NIMS).
2. The measurement of Raman profiles will be performed by optimizing the parameters exposure power density and time, and the sample preparation method.
3. The obtained Raman profiles of C_{60} nanofibers will be compared with those of pure C_{60} crystals and reveal the characteristics of the Raman profiles of C_{60} nanofibers.

Deliverables and Dissemination

- The standard Raman profiles of fullerene nanofibers will be recorded in the database of NIMS and made available on open access to researchers worldwide.
- VAMAS technical report

Funding

Participation is based on in-kind effort from the partners.

Status

Interlaboratory trial currently in progress. Additional participants welcome.

References

1. K.Miyazawa, A.Obayashi and M.Kuwabara, J.Am.Ceram.Soc., **84**(2001)3037
2. K.Miyazawa, Y.Kuwasaki, A.Obayashi and M.Kuwabara, J.Mater.Res., **17**(2002)83.
3. K.Miyazawa,J.Minato, T.Yoshii, M.Fujino and T.Suga, J.Mater.Res. **20** (2005) 688.
4. K.Miyazawa, J.Minato, T.Yoshii and T.Suga, Sci.Technol.Adv.Mater., **6**(2005)388.

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October 2009