Clayteam Seminar

"Innovative Printable-Electronics Materials and Applications Thereof"

Date and Time : Nov. 11, 2013 (Mon.)12:30-17:00 *Reception Starts 12:00-Venue : Lecture Hall, Auditorium-1st Floor, AIST Tsukuba Central1 1-1-1 Higashi, Tsukuba, Ibaraki 305-8561, Japan *Language : Japanese

[Program]

12:30-12:40	The 15th Clayteam Seminar [The Opening Remark]
12:40-13:40	【Chairperson】 Dr. Takeo Ebina, AIST <u>Speaker1</u> Keynote "Advanced Production Technology for Low-temperature Sintering Silver Nanoparticles" Prof. Masato Kurihara (Yamagata University)
13:40-14:40	<u>Speaker2</u> "Research and Development of the Carbon nanotube and Graphene Materials in Nanotube Research Center, AIST" Dr. Takeshi Sasaki (AIST)
14:40-14:50	Break
14:50-15:20	Speaker3 "Measurement techniques of dielectric permittivity and electromagnetic performance for materials in microwave and millimeter-wave frequency resions" Dr. Masahiro Horibe (AIST)
15:20-15:50	【Chairperson】 Dr. Yoshito Wakui, AIST <u>Speaker4</u> "Functional materials and related technologies for realizing flexible electronics" Dr. Manabu Yoshida (AIST)
15:50-16:20	Speaker5 "The Latest Trends in Flexible Electronic Paper" Dr. Manabu Ito (TOPPAN PRINTING CO., LTD.)
16:20-16:50	<u>Speaker6</u> "Synthesis of Copper Nitride Nanoparticles and Exploration of Decomposition Temperature by Decreasing Size in Nanometer Scale." Dr. Takashi Nakamura (AIST)
17:00	【The Closing Remark】

The 15th Clayteam Seminar

<Short Abstract>

[Speaker1] "Advanced Production Technology for Low-temperature Sintering Silver Nanoparticles" Prof. Masato Kurihara (Yamagata University)

Low-temperature sintering Ag nanoparticles (NPs) are one of the most promising electrode materials for printed electronics (PE). The drastic drop of the sintering temperature of Ag NPs to 100°C or less will be a key technology in PE We have invented the thermal decomposition technology of Ag oxalate to produce room-temperature sintering, high-quality and -performance Ag NPs.

[Speaker2] "Research and Development of the Carbon nanotube and Graphene Materials in Nanotube Research Center, AIST" Dr. Takeshi Sasaki (AIST)

In Nanotube Research Center, National Institute of Advanced Industrial Science and Technology (AIST), We focused on the development of the mass production of single wall carbon nanotubes and their applications, which would contribute the industrialization of nanocarbon materials, as a one of the members of Technical Research Association for Single Wall Carbon Nanotubes (TASC). Furthermore, the low temperature synthesis of large area graphene using plasma CVD technique is also studied for the development of the transparent conductive films and heat radiation materials which can be utilized for flexible devices. In this presentation, the R&D organization for CNT and graphene , and recent research activities in Nanotube Research Center are introduced.

[Speaker3] "Measurement techniques of dielectric permittivity and electromagnetic performance for materials in microwave and millimeter-wave frequency resions." Dr. Masahiro Horibe (AIST)

There are many types of material characteristics, i.e. mechanical, chemical and electrical characteristics. The electrical characteristics are most important in the electrical and electronic applications. The power electronics, i.e. Smart Grid and electronics, i.e. telecommunications and electronic devices are major two electronic application fields. The accurate values of dielectric permittivity and electromagnetic absorption performance, etc. must be used in the electronic device design. In this presentation, we would like to explain the measurement techniques of electromagnetic characteristics of materials, and then requirement of the material under test.

[Speaker4] **"Functional materials and related technologies for realizing flexible electronics"** Dr. Manabu Yoshida (AIST)

A printed RFID tag is a representative product utilizing flexible electronics. It is composed of high-frequency, analog, digital circuits and other components. There are many problems in producing these components using a printing technology; however, these problems will be overcome in the near future, utilizing newly developed printing techniques, related processes and materials. In this paper, the current development status in the printed RFID technology is introduced, and basic operating mechanisms of the RFID tag are explained.

[Speaker5] **"The Latest Trends in Flexible Electronic Paper"** Dr. Manabu Ito (TOPPAN PRINTING CO., LTD.)

Flexible electronic paper attracts a lot of attention due to its lightweight, thin, and non-fragile property. In this presentation, status of flexible electronic paper will be reviewed. Moreover, Toppan's proprietary fine resolution technique will be introduced. By using this technique, fully printed organic TFT array can be realized.

[Speaker6] "Synthesis of Copper Nitride Nanoparticles and Exploration of Decomposition

Temperature by Decreasing Size in Nanometer Scale."

Takashi Nakamura, Ph.D. (AIST)

For a research field of printed electronics which make electronic devices by printing methods, interconnection material is one of key matters. Recently, usage of copper related materials is progressed as an alternative material of gold and silver interconnection because of an advantage from a point of view of cost reduction. Although, copper is chemically unstable, that is, copper is easily oxidized. Additionally, to use copper as interconnection, the copper related materials have to be treated under complicate sintering process. For these reasons, there is a high barrier to apply the copper for interconnection materials in the field of the printed electronics.

I have focused on copper nitride (Cu3N) as a candidate of the interconnection materials because copper nitride has properties such as oxidation-resistant layer and decomposition temperature at around 350 degree centigrade in bulk state. By decreasing size of copper nitride in nanometer-scale, the decomposition temperature may be decreased. Based on this speculation, I am developing a new interconnection material having antioxidation property and low decomposition temperature as an alternative matter of copper related materials. In this presentation, I would like to present synthesis method of copper nitride nanoparticles under safe and mild condition, characterizations of resultants, and decomposing properties.