

Indonesian Researchers Developing Bio-Nanocomposite from Cellulose Fibers

Abstract:

Indonesia, blessed with abundant natural resources, is on its way creating new materials that are natural and more environmentally friendly for eco-friendly applications including bio-automobile, organic electronics, and structural building materials. Utilizing cellulose nanofibers, researchers in Indonesia are developing bio-nanocomposite materials that are flexible, transparent, mechanically strong and thermally stable. This research is in collaboration with a Japanese university and automobile industry and targets at automobile body weight and construction materials application. Attempting to preserve nature, laminated veneer lumber (LVL) has been developed from old rubber tree whose strength is equivalent to second class lumber such as teakwood. Prof Dr Bambang Subiyanto, Director of Center for Innovation of the Indonesian Institute of Sciences (LIPI), gave us more insights about his on-going projects and center's activities.

Impressed by nanotechnology related presentation delivered by Prof Dr Bambang Subiyanto, Director of Center for Innovation of the Indonesian Institute of Sciences (LIPI), in United Nation APCTT-ESCAP Consultative Workshop last December (<http://www.nanotech-now.com/columns/?article=390>), NanoGlobe team recently interviewed Dr Subiyanto to learn more insights about Indonesia's R&D activities and especially about bio-nanocomposite materials development.

Under the Ministry of Science and Technology of Indonesia, there exist a few of research institutes and one of them is Lembaga Ilmu Pengetahuan Indonesia (the Indonesian Institute of Sciences) or commonly known as LIPI (<http://www.lipi.go.id>). Established in August 1967, LIPI currently encompasses 22 Research Centers including Research Center for Physics, Metallurgy, Biotechnology, Chemistry, and Biomaterial, as well as Center for Innovation. Center for Innovation (<http://www.inovasi.lipi.go.id/baru/index.php?lang=en>) was established in June 2001 with two main objectives:

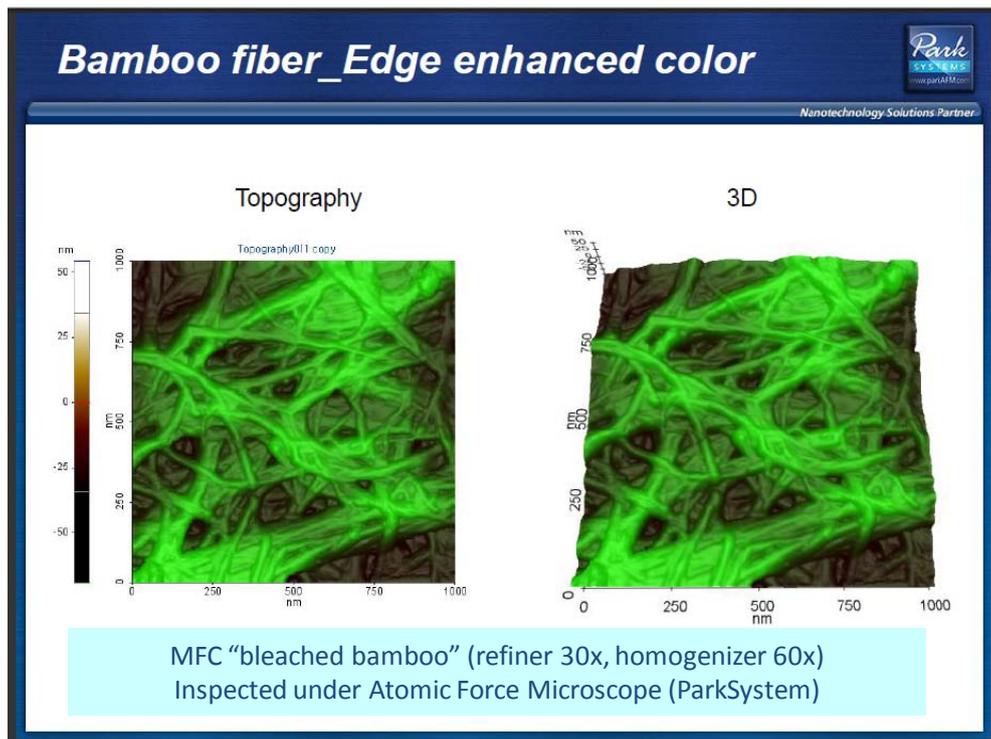
- to conduct studies and to develop and support the cooperation activities undertaken by various LIPI's research centers and technical implementation units with external parties, especially with industry, which attempt to commercialize the results of LIPI's R&D
- to examine the possibility of intellectual property protection of LIPI's R&D results and implement a process to obtain such protection

Besides being the Center Director, Dr Subiyanto together with his team of researchers at LIPI dedicate much of their time researching and developing bio (nano) composite from natural fibers and the waste

of agrobusiness (such as rice husks) especially for structural materials application. It is one of his interests and dreams to be able to construct earthquake friendly buildings with the materials his team is developing. His team has developed laminated veneer lumber (LVL) from old rubber tree for panel/partition and structural building materials. This LVL has been characterized to possess strength equivalent with second class lumber such as teakwood, miranti and keruing. A factory has been built to scale up the production of his LVL and they are currently searching for industry partnership to commercialize their research in construction materials application. Another material based on bamboo composite is also being developed to substitute nails and bolts for earthquake friendly building application.

Another interesting on-going project collaborated with Kyoto University is the development of cellulose nanofiber reinforced composite. It is believed to be as strong as steel, as thermally stable as glass and as flexible as plastics. Together with Kyoto University in Japan, the team has developed a transparent polymeric nanocomposite using a web-like bacterial cellulose nanofiber network as the mechanical reinforcing agent. Eventually, this material can be used for many applications including OLED and other electronic components, building materials, as well as automotive. The team has targeted to reduce the fuel consumption by 20% when cellulose nanofiber composite is used as reinforcement for the automobile body. This automobile application is also being developed together with prominent automotive manufacturer in Japan.

It is encouraging to know that developing countries such as Indonesia are actively pursuing nanotech R&D and application development in collaboration with developed countries such as Japan to accelerate the commercialization of nanotechnology. Japan offers advanced R&D capability and commercialization experience, while Indonesia provides natural and human resources. This partnership will accelerate Indonesia nanotechnology development and advancement of Indonesian R&D capabilities.





Samples of the bio composite

About Prof Dr Bambang Subiyanto:

Besides being the Director of Center for Innovation of LIPI since 2008, Dr Subiyanto is a Research Professor and Lead Investigator in LIPI focusing on wood science and technology. He obtained his Doctorate degree in Wood Science and Technology from Faculty of Agriculture, Kyoto University in 1991. He has been very much active participating in Wood Science seminars, symposiums and annual meetings in Japan since 1986. To date, he has published over 120 publications and filed 4 domestic patents including for bamboo composite products. He was awarded as the Best Young Scientist of LIPI within period of 1996-1997.