

**DRAFT REPORT FOR THE PLASTINDIA INTERNATIONAL UNIVERSITY WEBINAR ON  
“BIOBASED PLASTICS AND SUSTAINABILITY – ASPIRATIONS AND REALITY”  
AUG 4TH, 2022**

As per part of a joint program between Plastindia International University, PIU, and UMass Lowell, the sixth webinar on “Bio based Plastics and Sustainability – Aspirations and Reality” was delivered by Prof Ramaswamy Nagarajan on Aug 4th, 2022 06:00 PM (IST) / 08:30 AM (EST) onwards.

**Ms Pratiksha Jaipal** on behalf of Plastindia International University, welcomed all the attendees. She briefly reviewed the earlier webinars presented by Prof Wan Ting Grace Chen, Prof David Kazmer, Prof Stephen Driscoll, Prof Amir Ameli & Prof Davide Masato.

Jacqueline White, Manager of Corporate Training & Education introduced Prof Ramaswamy Nagarajan who was the speaker for the sixth webinar. He presented the webinar on Bio based Plastics and Sustainability – Aspirations and Reality.

Dr. Ramaswamy Nagarajan is a professor of Plastics Engineering at the University of Massachusetts Lowell. He is the co-director of the Center for Advanced Materials (CAM), co-founder and co-director of the Harnessing Emerging Research Opportunities to Empower Soldiers (HEROES) Initiative. He is also the co-Director of the Fabric Discovery Center at Lowell.

Dr. Nagarajan has a combination of science and engineering backgrounds with bachelor's degrees in chemistry and rubber technology and a doctoral degree in polymer science from the University of Massachusetts. His current research interests include greener advanced functional materials, multifunctional fabrics, greener flame retardant additives and surfactants, materials for energy conversion/storage and roll-to-roll manufacture of flexible electronic products. Dr Nagarajan is the co-editor of the Journal of Renewable Materials and has published 70 papers in peer-reviewed journals and holds 20 US Patents.

Professor Ramaswamy shared the good times through down the memory lane snippets which displayed the signing of agreement between UMASS LOWELL and PIU as well as the Plastivision Exhibition in Mumbai. The outline of his lecture consisted of key sustainability drivers, classifications and definitions, international standards, common bio-based polymers, sustainability issues of bio-based polymers, conclusion and path forward. He reviewed the global plastics market and the waste generated. He observed that plastics waste will grow three times by 2060. He pointed out that biodegradability depends on the environment. He informed that European Parliament has banned the Oxo-degradable plastics in May 2019. Prof Ram introduced the need for bio-based plastics. He compared the market size of bio-based plastics and synthetic plastics. The bio-plastics are divided into four categories

- a. Bio-based but non-biodegradable [Bio-PE, Bio-PP, Bio-PU, etc.]
- b. Bio based and Bio degradable [Polysaccharides, natural rubber, etc.]
- c. Fossil fuel based and non- biodegradable [Most synthetic plastics
- d. Fossil fuel based and biodegradable [PBAT, PCL, etc].

There are polymers which are made from renewable resources like alcohol, molasses, etc. The alcohol is dehydrated to produce ethylene which can be a building block for PE. However, the properties of polyethylene made from fossil fuels (crude oil) and polyethylene made from renewable resources are not different. The PE is non-biodegradable and prone to oxidation also.

He explained the natural polymers such as natural rubber, cellulose, starch, sugar, lignin and chitin. These polymers are abundantly available in the nature and are truly sustainable. The natural polymers however, are hydrophilic since they absorb moisture. The end uses of such products therefore are limited.



The other category includes polymers, such as poly lactic acid, poly-hydroxyl butyrate, poly-hydroxy valerate, etc. These polymers are made from natural resources using biochemical routes. The properties of these polymers are quite attractive for industrial use. The market for these polymers is slowly growing. The disposal of these polymers have their own issues.

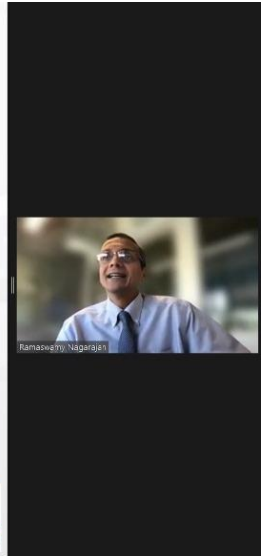
The type of polymers which is being investigated on a large scale throughout the world. PBAT, PBS, etc.

Post Dr. Nagarajan's informative presentation, there was an interesting Q&A session moderated by Prof Dr DD Kale. He pointed out during Q&A session that the properties of virgin synthetic non-degradable plastics and biodegradable plastics are different and hence application oriented criteria should be used for selection. If synthetic plastics are burnt scientifically, it should not contribute to the carbon footprint significantly.

Dr Kale also thanked Prof Nagarajan and colleagues at UMass Lowell, PIU & Polymerupdate for a successful webinar presentation while presenting the vote of thanks.



**Signing of the agreement with Plastindia  
Oct. 2016**



Dignitaries from Plastindia International University and University of Massachusetts, Lowell, USA