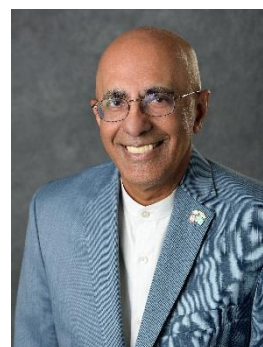


## Ramani Narayan

### 报告人简介：

Ramani Narayan 是密歇根州立大学(MSU)的杰出教授-MSU 授予教师的最高荣誉。他是美国国家发明学院的当选院士、ASTM&ASTM 奖学金获得者-社会对个人会员颁发的最高奖项。他因商业化才能而被授予州长（密歇根州）大学奖；因开发可生物降解的包装和绝缘泡沫获得密歇根绿色化学奖绿色化学州长奖；他是



葡萄牙里斯本大学科布莱恩特科技管理与商业化的杰出讲座主席；作为可口可乐工厂瓶装团队的一部分，获得杜邦的创新与可持续发展卓越包装奖。

Narayan 教授是美国生物降解产品研究所（BPI）的科学主席；ISO（国际标准化组织）委员会的召集人/技术专家；他是生物塑料领域许多组织和团体的技术顾问-世界自然基金会领导的生物塑料原料联盟，美国农业部 Biopreferred 组织，可口可乐公司植物瓶咨询委员会。他是纳斯达克公司 Northern Technologies 的董事会成员（纳斯达克股票代码：NTIC）。

他拥有 200 多种推荐出版物，30 项已发布专利，有 20 名博士和 25 名硕士生。他是一位成功的企业家，关键技术是：PLA 技术开发和工程规模，在内布拉斯加州布莱尔有高达 15 万吨的生产线，生产通过 Natur-Tec / Northern Technologies International 商业化的先进 PLA-生物聚酯杂化树脂材料([www.natur-tec.com](http://www.natur-tec.com))。他是 EcoSynthetix 公司创始成员 ([www.ecosynthetix.com](http://www.ecosynthetix.com))，开发环保型生物基材料组合-加拿大证券交易所（TSE: ECO）。与 Zeeland Farm Services 合作开发用于柔性和硬质聚氨酯泡沫应用的生物基多元醇。ZFS([www.zfsinc.com](http://www.zfsinc.com)) 是一家价值 1.5 亿美元的私营农业企业，拥有 200 多名员工。

## **Ramani Narayan**

### **Profile of the Author:**

Ramani Narayan is University Distinguished Professor at Michigan State University -- the highest honor that MSU bestows on a faculty member. He is an elected Fellow of the U.S. National Academy of Inventors; Fellow, ASTM & ASTM award of merit -- the highest award given by the society to an individual member. He has been awarded the Governor's (State of Michigan) University Award for commercialization excellence; Michigan Green Chemistry Award Green Chemistry Governor's Award for developing biodegradable packaging and insulation foams; Fulbright Distinguished Lectureship Chair in Science & Technology Management & Commercialization at University of Lisbon; Portugal; DuPont's Packaging Award for excellence in Innovation & Sustainability, as part of the Coca Cola Plant bottle team, and many others.

Professor Narayan is Scientific Chair of the Biodegradable Products Institute (BPI) USA; and convener/technical expert on ISO (International Standards Organization) committees; He is technical advisor to many organizations and groups in the bioplastics space – WWF led bioplastics feedstock alliance; USDA BiopREFERRED program, Coca-Cola company plant bottle advisory Board. He serves on Board of Directors of a NASDAQ company Northern Technologies (NASDAQ:NTIC).

He has 200+ refereed publications, 30 issued patents, and graduated 20 Ph. D and 25 Master's students. He is a successful entrepreneur –key technologies are: PLA technology development & engineering scale-up to 150, 000-ton production facility in Blair, Nebraska. Advanced PLA-biopolyester hybrid resin materials commercialized through Natur-Tec/Northern Technologies International; [www.natur-tec.com](http://www.natur-tec.com). Founding member of EcoSynthetix Inc.; [www.ecosynthetix.com](http://www.ecosynthetix.com) developing a portfolio of environmentally responsive biobased materials -- Canadian Stock Exchange (TSE:ECO). Developing biobased polyols for flexible and rigid polyurethane foam applications in cooperation with Zeeland Farm Services. ZFS ([www.zfsinc.com](http://www.zfsinc.com)) is a \$150 million privately held agribusiness employing 200+ people.

# 一个需要关注和警示的问题—可降解性和生物降解性

Ramani Narayan

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**摘要：**作为解决海洋和陆地中塑料污染日益增长的问题的解决方案，可降解和可生物降解的塑料继续在世界范围内扩散和发展。公司正在推广可降解/可生物降解塑料以解决塑料废弃物问题。

文章出现在同行评审的文献中，并在印刷版，电视和电子媒体中广泛覆盖，用大型生物如食虫和蜡蛾作为塑料废弃物管理的解决方案。*Science* 和 *PNAS* 报告了微生物和酶系统，包括用于分解 PET 分子的突变酶，作为 PET 的“突破”和海洋中的塑料废弃物污染。生物降解塑料作为海洋塑料污染和废弃物管理的解决方案在文献中比比皆是。

此次讲座将表明，将获得的数据推断为塑料废弃物解决方案的主张并未得到证实，并且非常具有误导性。它影响了正在发展的严肃的临终解决方案。显然，生物降解性作为对陆地和海洋上的塑料废弃物的解决方案有一定的作用。这些是“经过认证的可生物降解的可堆肥塑料”，与闭环堆肥和厌氧消化处理系统或农业应用的土壤系统相结合。

加利福尼亚州禁止使用“可生物降解”的营销声明，美国联邦贸易委员会（美国联邦贸易委员会）对可降解，可生物降解和可堆肥的营销声明有严格的指导。

零售业巨头亚马逊同意因误导性地标记为“可生物降解”或可堆肥支付 110 万美元。在同一问题上，沃尔玛和好市多与加利福尼亚州达成了类似的 100 万美元和 50 万美元的和解协议。

在本次讲座中，我们将回顾这些问题并学习“生物降解性”和“可堆肥性”的基本原理。我们提醒不要将可降解或可生物降解的无条件声称作为塑料废物问题的解决方案。

# **On the Subject of Degradability & Biodegradability – A Message of Concern & Alarm!**

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**Abstract:** Degradable and biodegradable plastics continue to proliferate and grow world-wide as solutions to the ever increasing concerns about plastics pollution in the oceans and on land. Companies are promoting their degradable/biodegradable plastics as solution to plastics waste problem.

Articles have appeared in peer reviewed literature and widely covered in print, TV, and E-media of macro-organisms like meal worms and wax moth as solutions for plastic waste management. Science and PNAS carried reports of microorganisms, and enzyme systems, including a mutant enzyme to break down PET molecule as the “breakthrough” to the PET and plastic waste pollution in the oceans. Biodegradable plastics as a solution for ocean plastics pollution and waste management abound in the literature

This lecture will show that extrapolating the obtained data to claims of a solution to plastic waste is not substantiated and very misleading and troublesome. It takes away from serious end-of-life solutions being developed. Clearly, there is a role for biodegradability as an environmentally responsible end-of-life solution to the plastic waste on land and oceans. These are “certified biodegradable-compostable plastics” in concert with managed, close-loop composting and anaerobic digestion disposal systems or with soil systems for agricultural applications.

The State of California prohibits using “biodegradable” marketing claims and the U.S. Federal Trade Commission (U.S. FTC) have strict guidelines on degradable, biodegradable, and compostable marketing claims.

The retail giant Amazon agreed to a \$1.1 million settlement on selling products misleadingly labelled “biodegradable” or compostable. Similar \$1 million and \$0.5 million settlements with Walmart and Costco were reached with the State of California

on the same issue.

In this lecture, we will review these issues and learn the fundamentals of “biodegradability” and “compostability”. We caution against making unqualifi