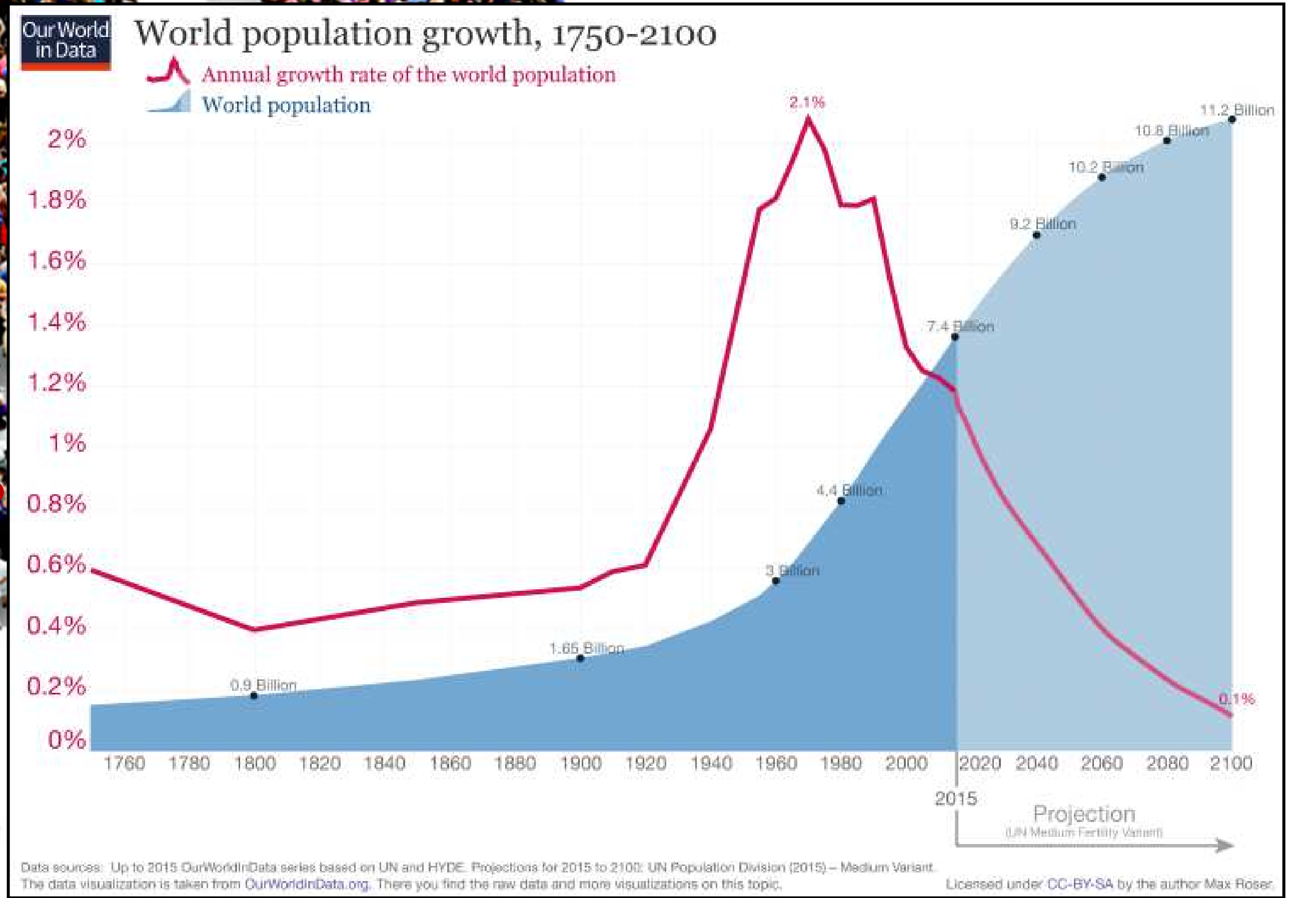
NON LA SOLITA PLASTICA: NUOVE TENDENZE E MODELLI PER IL RICICLO E LA SOSTENIBILITA'

"NULLA SI DISTRUGGE, TUTTO SI TRASFORMA"
- Lavoisier -

Food, Loss and Waste: il ruolo della plastica nel confezionamento alimentare - *Pavia – 17 Maggio 2018*

Dott. Paolo M. Micheli – Segretario Ordine dei Chimici della Provincia di Pavia

LE PROIEZIONI MOSTRANO UNA CRESCITA COSTANTE DELLA POPOLAZIONE MONDIALE



L'EUROPA DA SOLA PRODUCE 25 MILIONI DI TONNELLATE/ANNO DI RIFIUTI PLASTICI MA SOLO IL 30% È ATTUALMENTE RICICLATO

"ON JULY 18TH CHINA TOLD THE WORLD TRADE ORGANISATION THAT BY THE END OF THE YEAR, IT WILL NO LONGER ACCEPT IMPORTS OF 24 CATEGORIES OF SOLID WASTE AS PART OF A GOVERNMENT CAMPAIGN AGAINST YANG LAJI OR "FOREIGN GARBAGE". THE MINISTRY OF ENVIRONMENTAL PROTECTION SAYS RESTRICTING SUCH IMPORTS WILL PROTECT THE ENVIRONMENT AND IMPROVE PUBLIC HEALTH"

– THE ECONOMIST AUG 3RD 2017

Adobe Acrobat Document

Ref.: Global recycling markets: plastic waste *A story for one player – China*

ISWA International Solid Waste Association

NUOVA AGENDA DI POLITICA AMBIENTALE

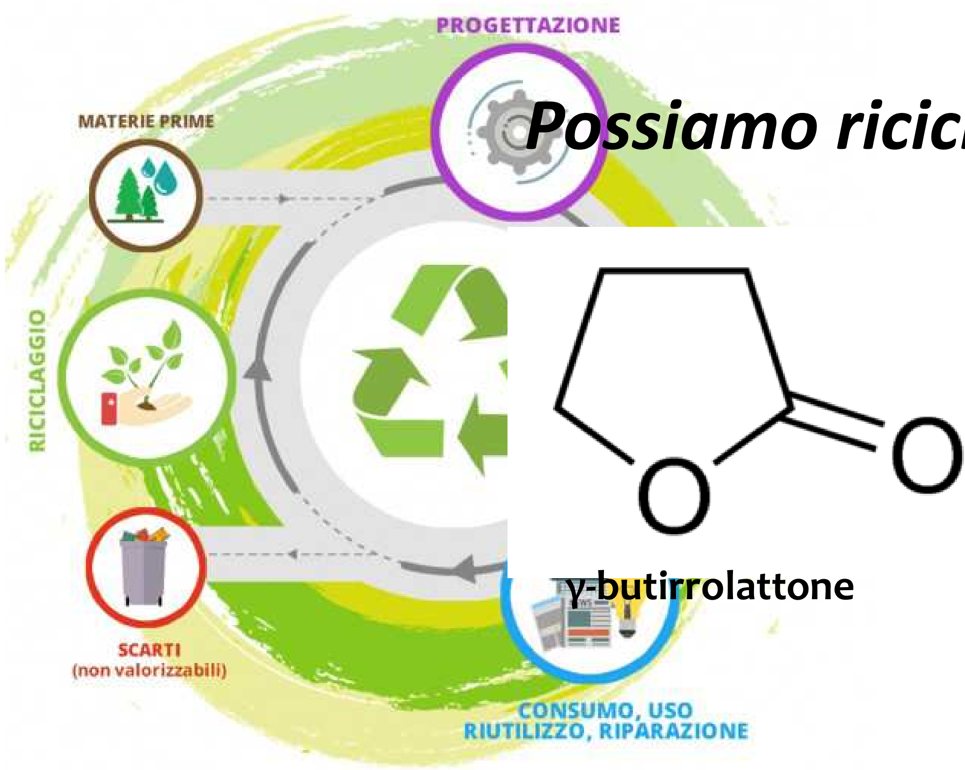
2025
- 55% RSU riciclati
- 65% imballaggi riciclati (almeno 50% per quelli in plastica)

2030
- 60% RSU riciclati
- 70% imballaggi riciclati (almeno 55% per quelli in plastica)

2035
- 65% RSU riciclati

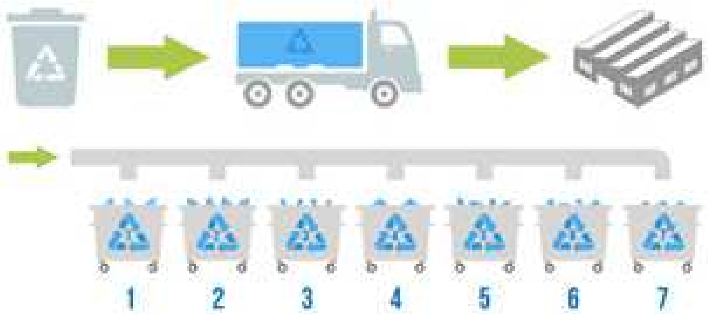
http://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf

Possiamo riciclare all'infinito?

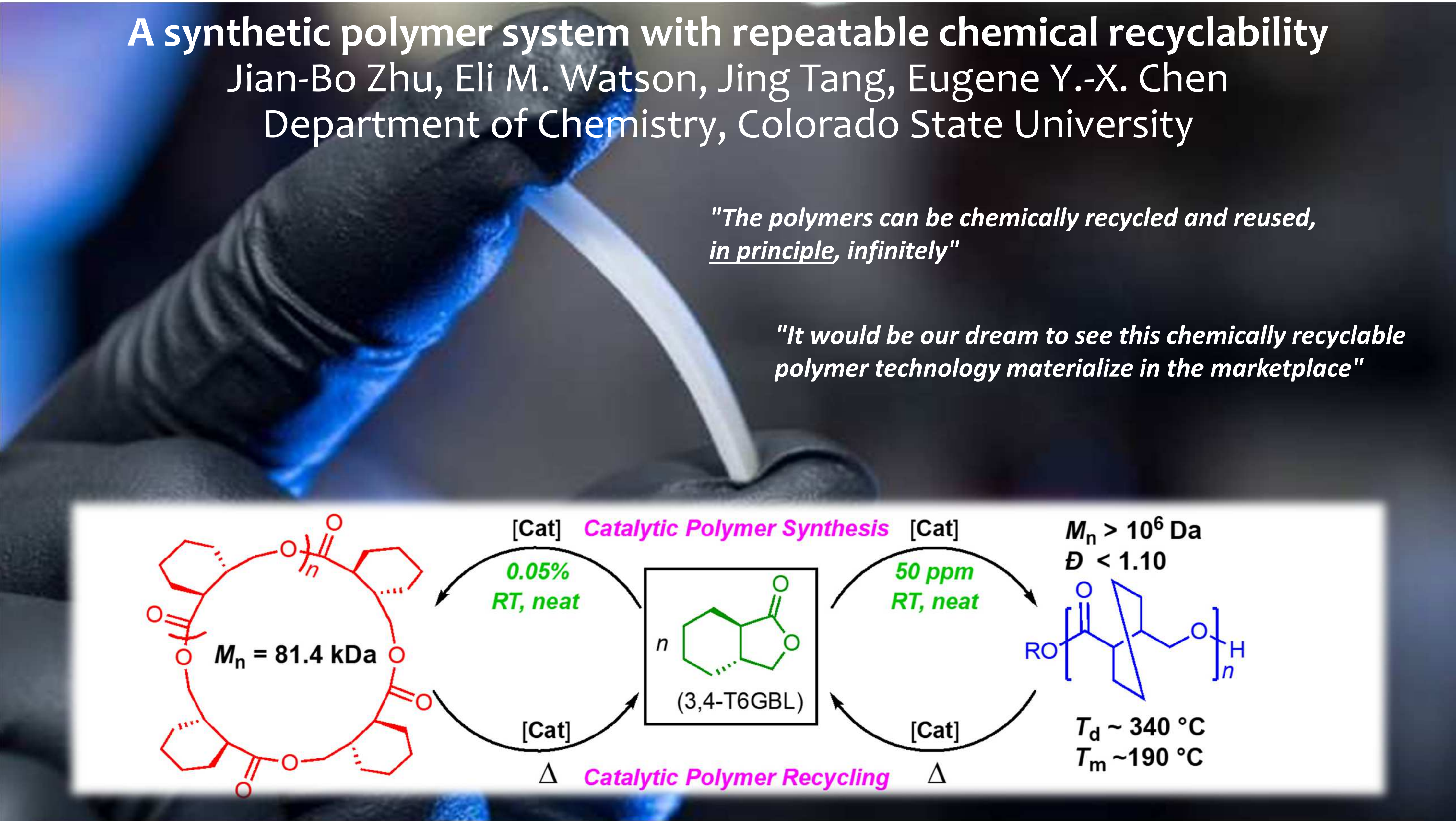


γ-butirrolattone

Science 27 Apr 2018:
Vol. 360, Issue 6387, pp. 398-403
DOI: 10.1126/science.aar5498



PERIODIC GRAPHICS

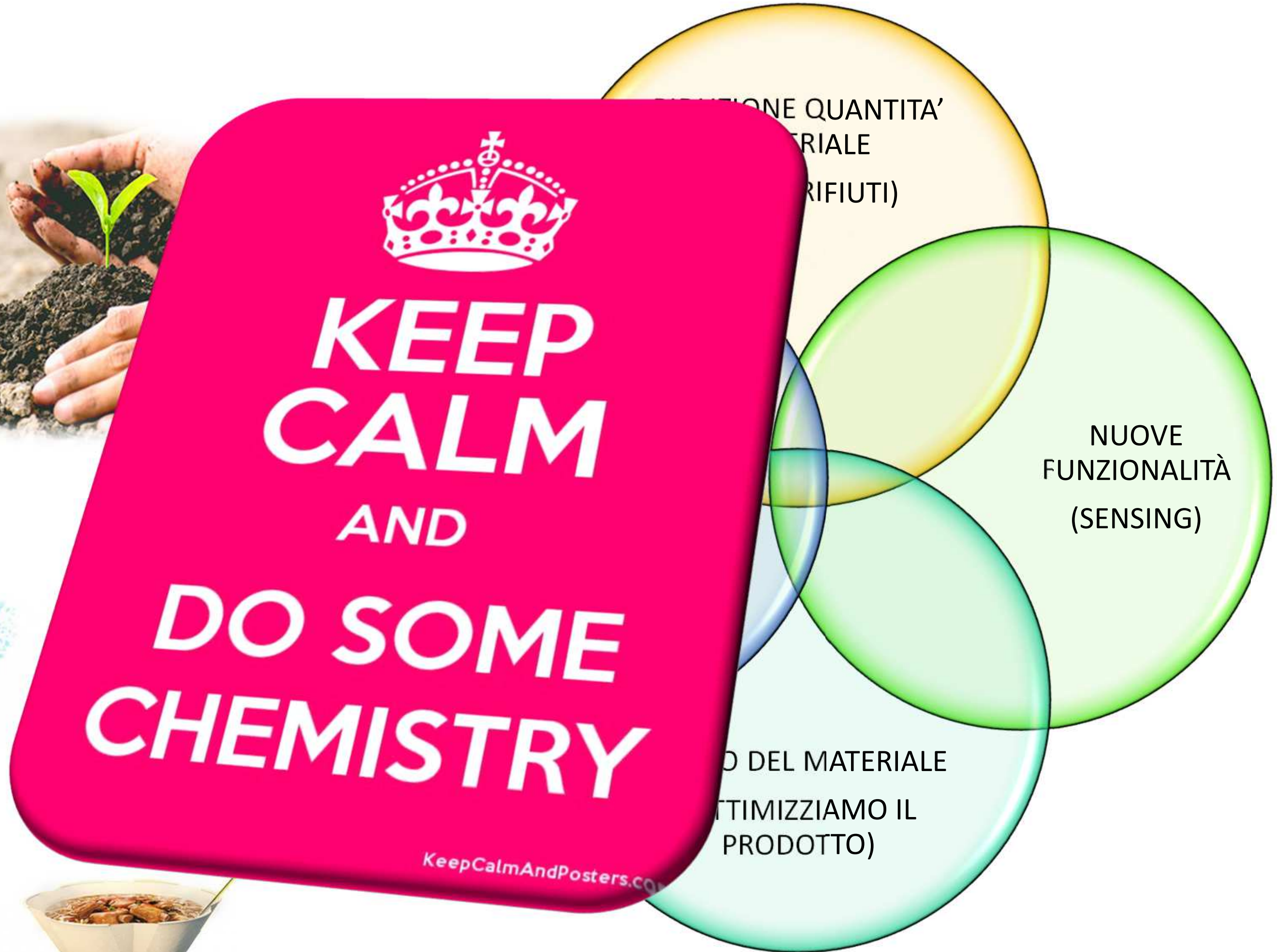

A synthetic polymer system with repeatable chemical recyclability
Jian-Bo Zhu, Eli M. Watson, Jing Tang, Eugene Y.-X. Chen
Department of Chemistry, Colorado State University
"The polymers can be chemically recycled and reused, in principle, infinitely"
"It would be our dream to see this chemically recyclable polymer technology materialize in the marketplace"
[Cat] Catalytic Polymer Synthesis [Cat]
0.05% RT, neat
50 ppm RT, neat
M_n = 81.4 kDa
(3,4-T6GBL)
$M_n > 10^6$ Da
$Đ$ < 1.10
RO
H
n
T_d ~ 340 °C
T_m ~190 °C
[Cat]
Δ
Catalytic Polymer Recycling
[Cat]
Δ


IL PACKAGING PLASTICO DA MATERIALE
“PASSIVO”
DIVENTA
“ATTIVO”
CAMBIARE IL NOSTRO RAPPORTO CON LA PLASTICA?
SICUREZZA
SVILUPPO
MATERIE PRIME
PROGETTAZIONE
PRODUZIONE RIFABBRICAZIONE
DISTRIBUZIONE
CONSUMO, USO RIUTILIZZO, RIPARAZIONE
RACCOLTA
RICICLAGGIO
ECONOMIA CIRCOLARE
RIFIUTI RESIDUI

www.skippingrockslab.com/ooho!.html

Biodegradable materials derived from food ingredients such as polysaccharides, proteins, and lipids

COME IL PACKAGING ALIMENTARE DIVENTA SMART



MATERIALI A CONTATTO CON ALIMENTI

DOPO OPPORTUNE CONSULTAZIONI ED APPROFONDIMENTI DELLA TEMATICA, NEL GENNAIO 2016 L'EFSA HA PUBBLICATO IL PROPRIO PARERE SCIENTIFICO, ATTESTANDO CHE I MATERIALI DI CONFEZIONAMENTO DEI PRODOTTI ALIMENTARI ED I CONTENITORI (QUALI BOTTIGLIE, TAZZE E PIATTI, UTILIZZATI PER MIGLIORARE LA MANIPOLAZIONE ED IL TRASPORTO DEGLI ALIMENTI) POSSONO CONTENERE SOSTANZE CHIMICHE IN GRADO DI MIGRARE NEGLI ALIMENTI.

CIÒ RENDE NECESSARIO AFFINARE LA VALUTAZIONE DELLA SICUREZZA RIGUARDO LE SOSTANZE CHIMICHE USATE NELLA REALIZZAZIONE DEI MATERIALI A CONTATTO CON GLI ALIMENTI.

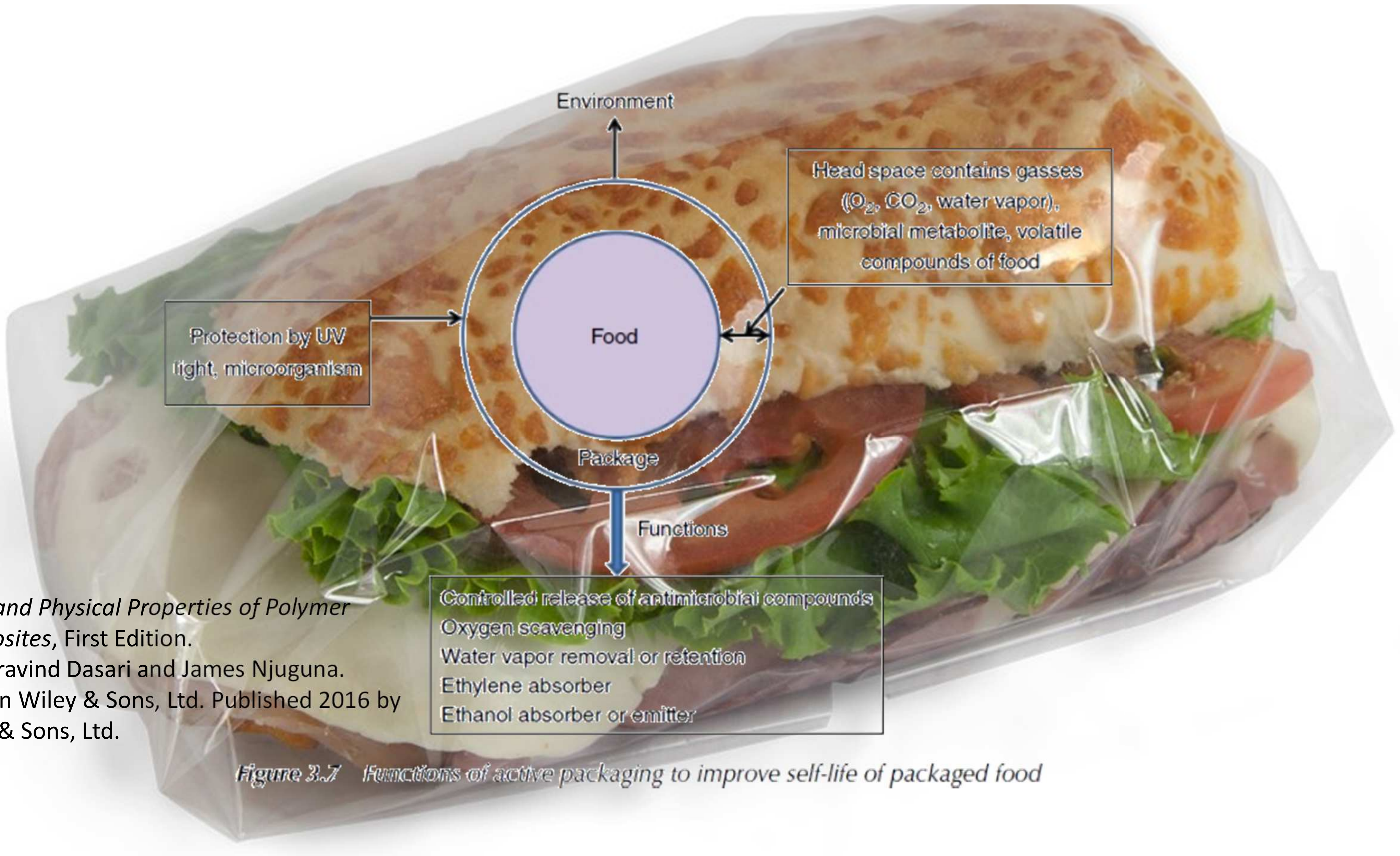
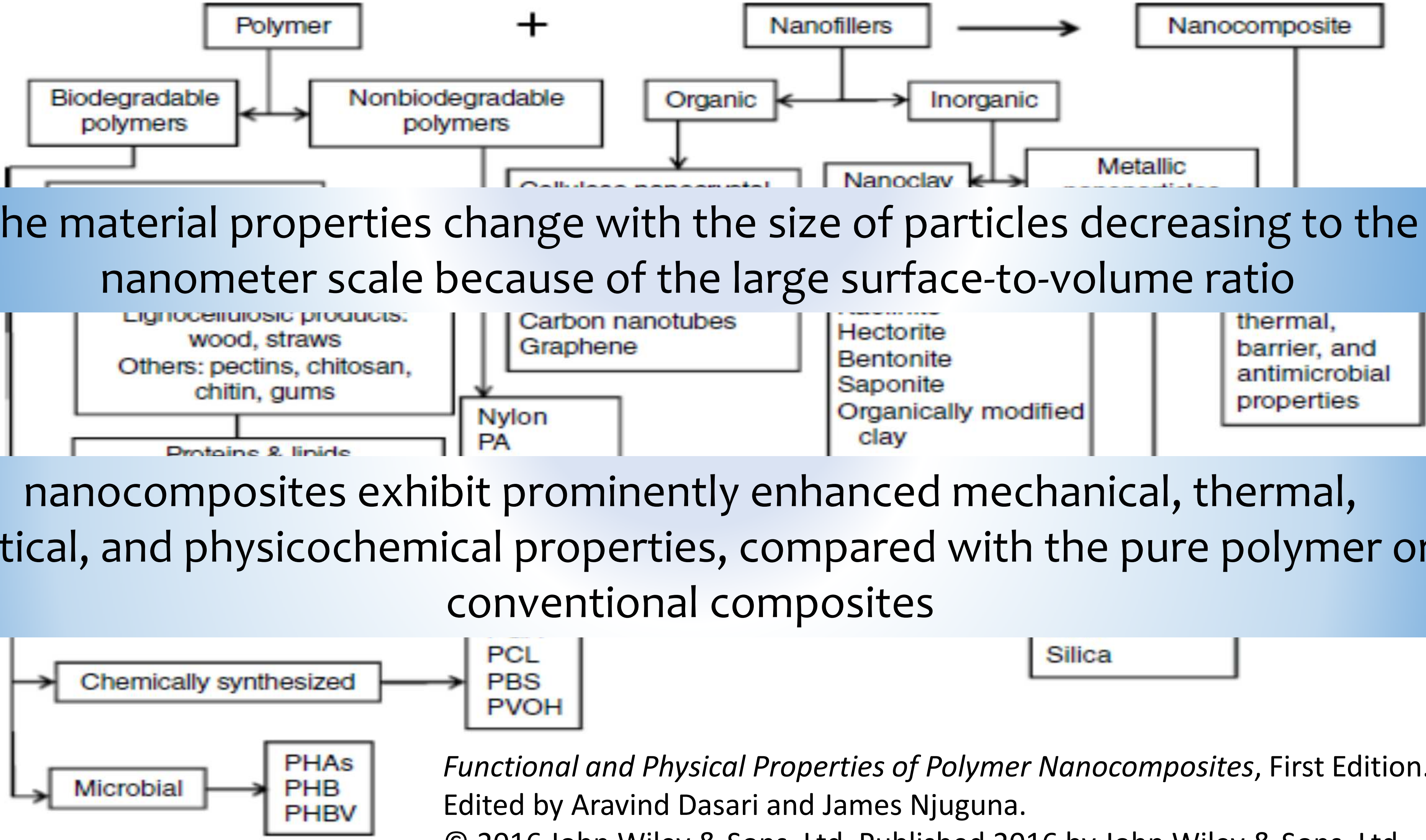


Figure 3.7 Functions of active packaging to improve self-life of packaged food

The material properties change with the size of particles decreasing to the nanometer scale because of the large surface-to-volume ratio

nanocomposites exhibit prominently enhanced mechanical, thermal, optical, and physicochemical properties, compared with the pure polymer or conventional composites



Functional and Physical Properties of Polymer Nanocomposites, First Edition.
Edited by Aravind Dasari and James Njuguna.

Figure 3.2 *Composition and sources for the components of polymer nanocomposite*

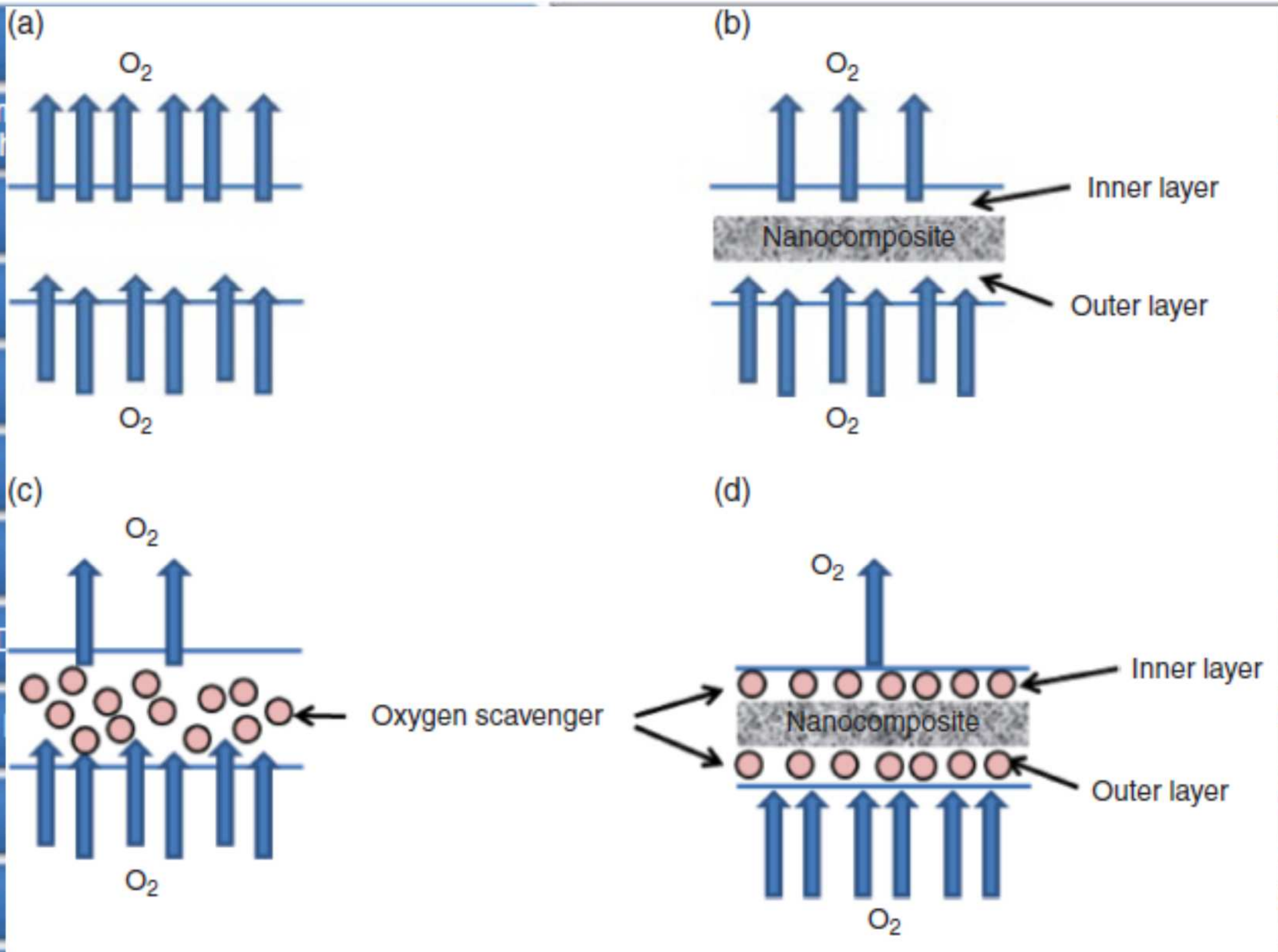


Figure 3.6 *Diagrammatic representation of the structures of multilayer nanocomposite for oxygen (O_2) barrier packaging: (a) neat polymer film without barrier, (b) nanocomposite layer as passive barrier, (c) oxygen scavengers as active barrier, and (d) mixture of active (oxygen scavenger) and passive (nanocomposite) barrier*

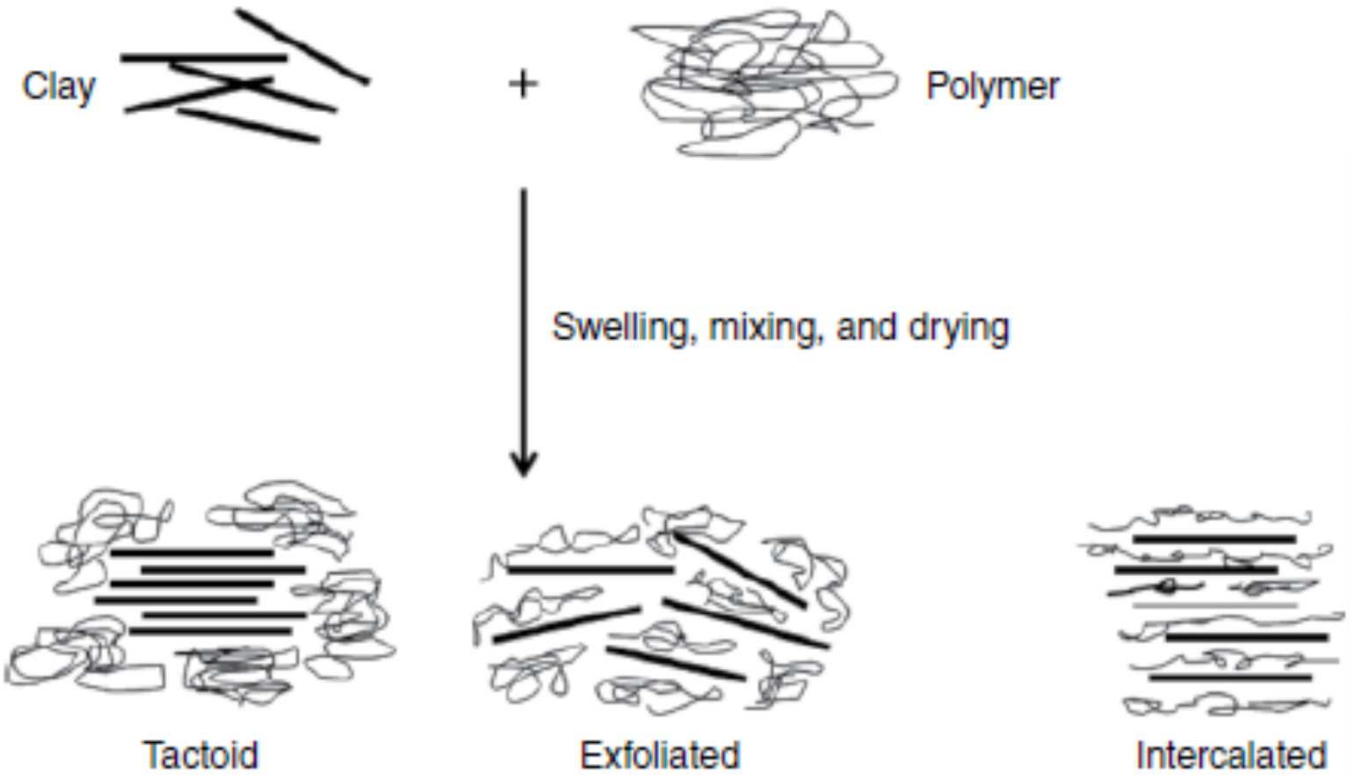
INNOVATION	DESCRIPTION	CURRENT STATE
Removing additives	Separating additives from recovered polymers to increase recyclate purity	Lab stage: Some technologies exist but with limited application
Reversible adhesives	Recycling multi-material packaging by designing 'reversible' adhesives that allow for triggered separation of different material layers	Conceptual stage: Innovation needed to develop cost-competitive adhesive
Super-polymer	Finding a super-polymer that combines functionality and cost with superior after-use properties	Conceptual stage: Innovation needed to develop cost-competitive polymer with desired functional and after-use properties
Depolymerisation	Recycling plastics to monomer feedstock (building blocks) for virgin-quality polymers	Lab stage: Proven technically possible for polyolefins Limited adoption: Large-scale adoption of depolymerisation for PET hindered by processing costs
Chemical markers	Sorting plastics by using dye, ink or other additive markers detectable by automated sorting technology	Pilot stage: Food-grade markers available but unproven under commercial operating conditions
Near infrared	Sorting plastics by using automated optical sorting technology to distinguish polymer types	Fragmented adoption: Large-scale adoption limited by capex demands
Benign in marine environments	Design plastics that are less harmful to marine environments in case of leakage	Lab stage: First grades of marine degradable plastics (one avenue towards benign materials) already certified as marine degradable — impact of large-scale adoption to be proven
Benign in fresh water	Design plastics that are less harmful to freshwater environments in case of leakage	Lab stage: Marine degradable plastics theoretically freshwater degradable. One certified product — impact of large-scale adoption to be proven
GHG-based	Sourcing plastics from carbon in greenhouse gases released by industrial or waste management processes	Pilot stage: CO_2-based proven cost competitive in pilots; methane-based being scaled up to commercial volumes
Bio-based	Sourcing plastics from carbon in biomass	Limited adoption: Large-scale adoption hindered by limited economies of scale and sophistication of global supply chains

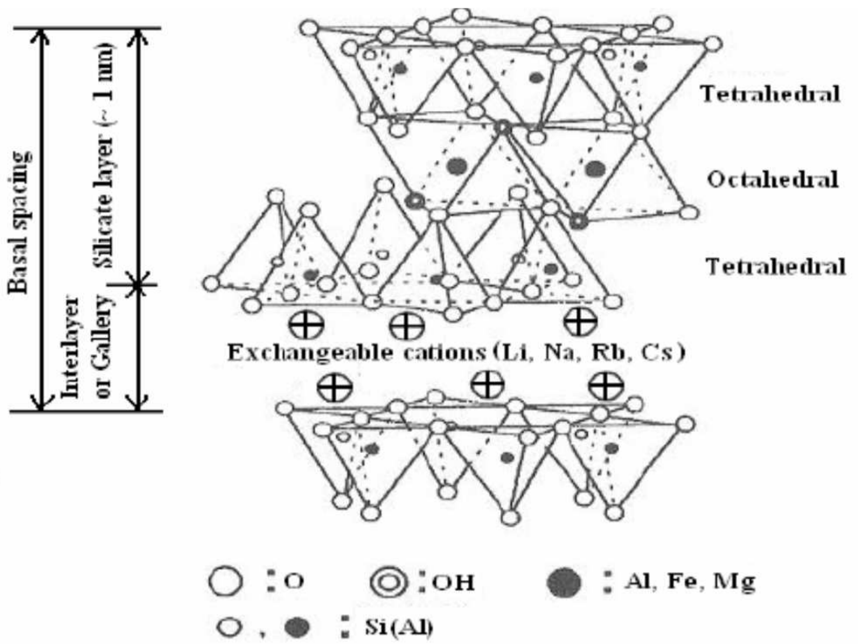
World Economic Forum, Ellen MacArthur Foundation and McKinsey & Company,
The New Plastics Economy — Rethinking the future of plastics
(2016, http://www.ellenmacarthurfoundation.org/publications).

Time/temperature indicators (TTIs) **biological, chemical, physical, response (single, multi), origin (extrinsic, intrinsic), application (dispersed, permeable, isolated) and location (volume average or single point)**

Freshness indicators

Based on indicator color change in response to microbial metabolites produced during spoilage






That's all Folks!

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