Plastics

General context in materials science and engineering

Historical background and importance

Ulisses

UNIVERSITY OF LISBON
INTERDISCIPLINARY STUDIES
ON SUSTAINABLE ENVIRONMENT AND SEAS

Augusto Moita de Deus
Mechanical Design and Engineering Materials
Mechanical Engineering Department
Instituto Superior Técnico, University of Lisbon

Beatriz Silva
Manufacturing and Industrial Engineering
Mechanical Engineering Department
Instituto Superior Técnico, University of Lisbon

ulisses.ulisboa.pt

unite! University Network for Innovation, Technology and Engineering

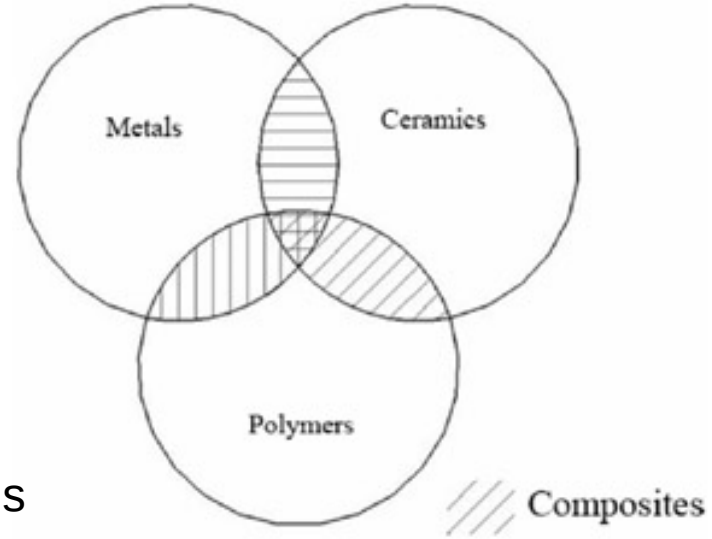
U LISBOA | UNIVERSIDADE DE LISBOA

Co-funded by the Erasmus+ Programme of the European Union

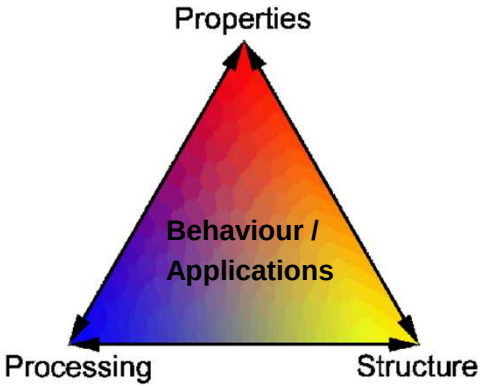
Plastics

Classes of common materials used in everyday applications:

- 3 main classes + 1 (composites)



Science field that studies materials: materials science and engineering

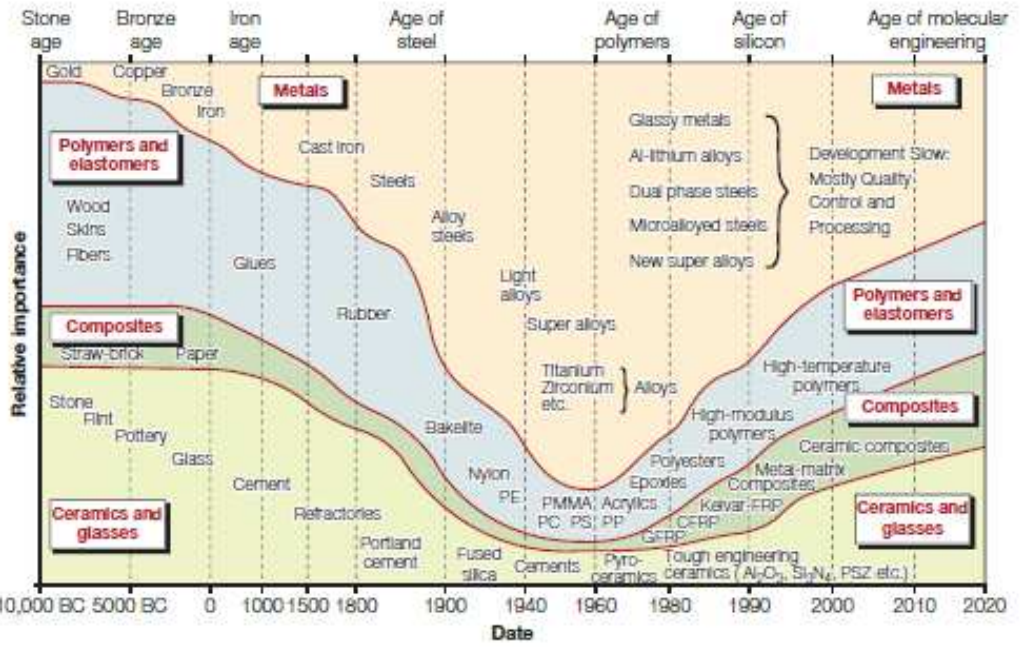


- Focus on behaviour and applications of materials, by studing their structure, properties and processing
- Polymer science

Plastics

Use of materials during the centuries

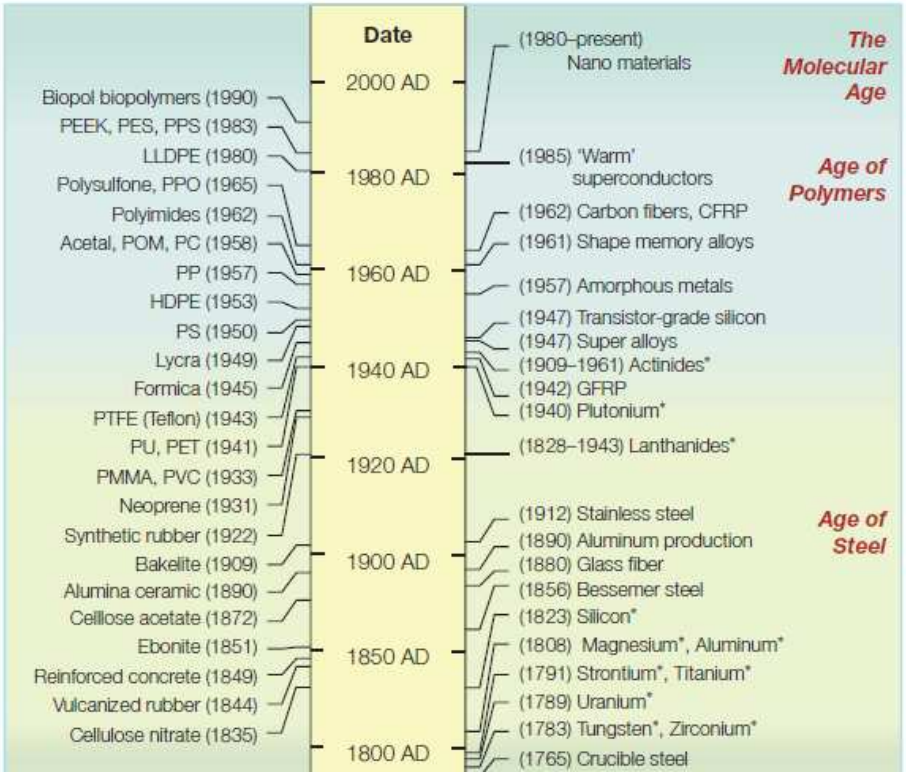
- Notice the increase of relative importance of synthetic polymers starting in the 50’s of last century
- The trend is for plastics to continue to have extensive use in daily applications



The evolution of engineering materials with time. "Relative importance" is based on information contained in the books listed under "Further reading"; plus, from 1960 onward, data for the teaching hours allocated to each material family at U.K. and U.S. universities. The projections to 2020 rely on estimates of material usage in automobiles and aircraft by manufacturers. The time scale is nonlinear. The rate of change is far faster today than at any previous time in history.

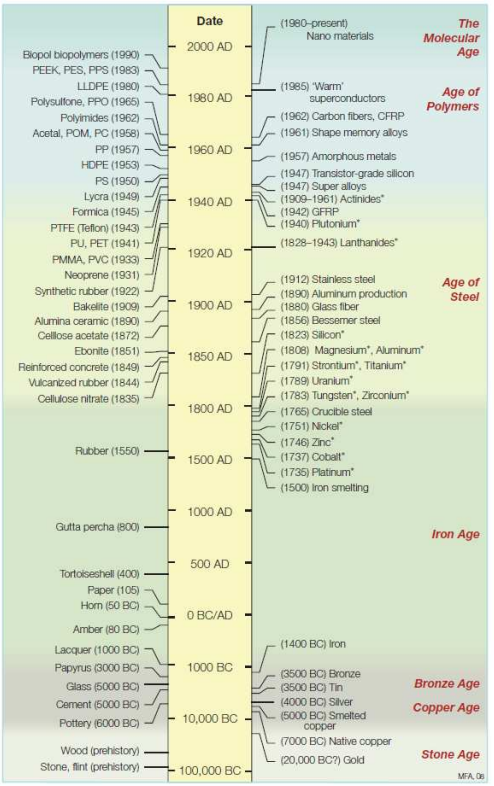
unite! University Network for Innovation, Technology and Engineering
U LISBOA | UNIVERSIDADE DE LISBOA
Co-funded by the Erasmus+ Programme of the European Union

Plastics



Use of materials during the centuries

A materials timeline. The scale is nonlinear, with big steps at the bottom, small ones at the top. An asterisk (*) indicates the date at which an element was first identified. Labels without asterisks note the time at which the material became of practical importance.



unite! University Network for Innovation, Technology and Engineering

U LISBOA | UNIVERSIDADE DE LISBOA

Co-funded by the Erasmus+ Programme of the European Union

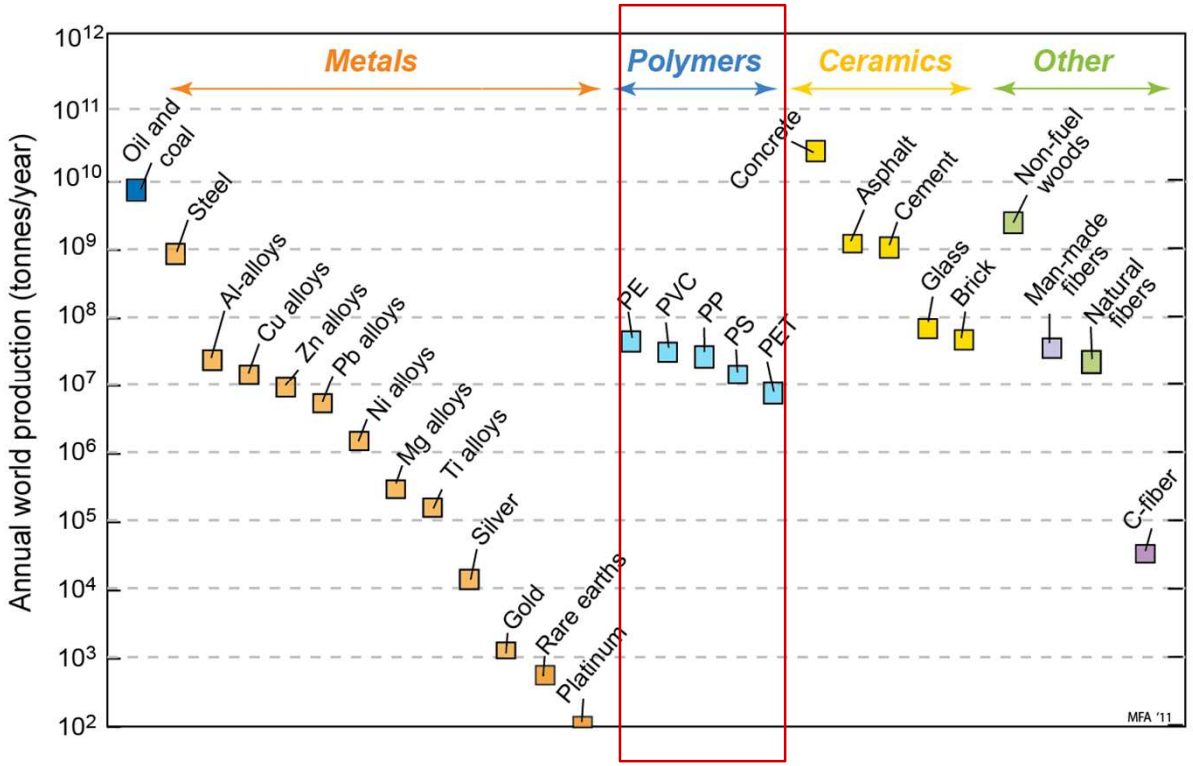
Plastics

Plastics are everywhere, to our delight and to our convenience…

…but also to our great concern

Plastics

Polymers in today's World



Annual World Production

Plastics

Polymers are important

Polymers have evolved from the materials of throw-away products to serious engineering materials enabling weight-saving structures

200~300kg of cars are now made of polymers
(10-20% of weight on average)

- Composites rely heavily on polymers

A Boeing 787 has 36 ton of polymer composites
(50% of air-frame weight)

unite! University Network for Innovation, Technology and Engineering
U LISBOA | UNIVERSIDADE DE LISBOA
Co-funded by the Erasmus+ Programme of the European Union

Plastics

In summary

- Polymers are one out of three main classes of common materials used in everyday applications
- Synthetic polymers are relatively recent
- Polymers are important

References / Source Material

Materials Selection in Mechanical Design, Michael F. Ashby, Butterworth-Heinemann

https://www.grantadesign.com/education/teachingresources/

unite! University Network for Innovation, Technology and Engineering

U LISBOA | UNIVERSIDADE DE LISBOA

Co-funded by the Erasmus+ Programme of the European Union

Plastics

General context in materials science and engineering

Historical background and importance

Augusto Moita de Deus
Mechanical Design and Engineering Materials
Mechanical Engineering Department
Instituto Superior Técnico, University of Lisbon

Beatriz Silva
Manufacturing and Industrial Engineering
Mechanical Engineering Department
Instituto Superior Técnico, University of Lisbon

Ulisses

UNITE! University Network for Innovation, Technology and Engineering

U LISBOA | UNIVERSIDADE DE LISBOA