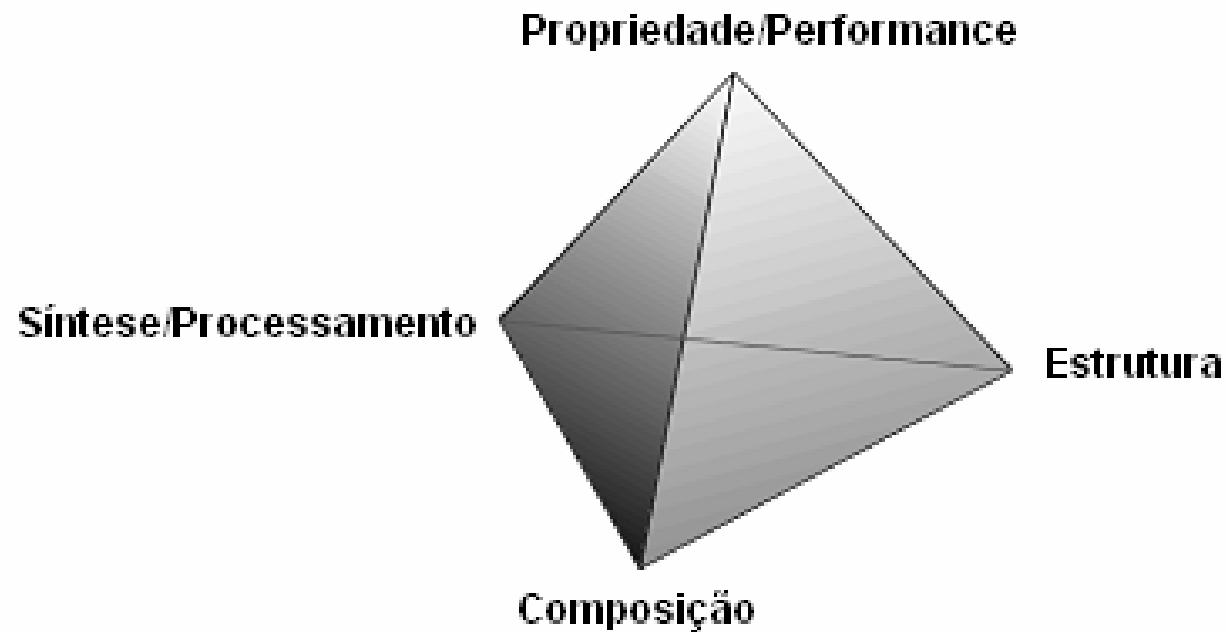


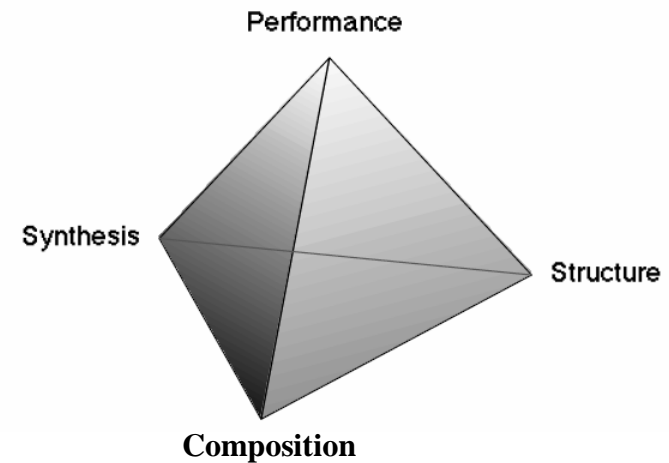
Tetraedro de Ciência e Engenharia de Materiais



Ciência e Engenharia de Materiais

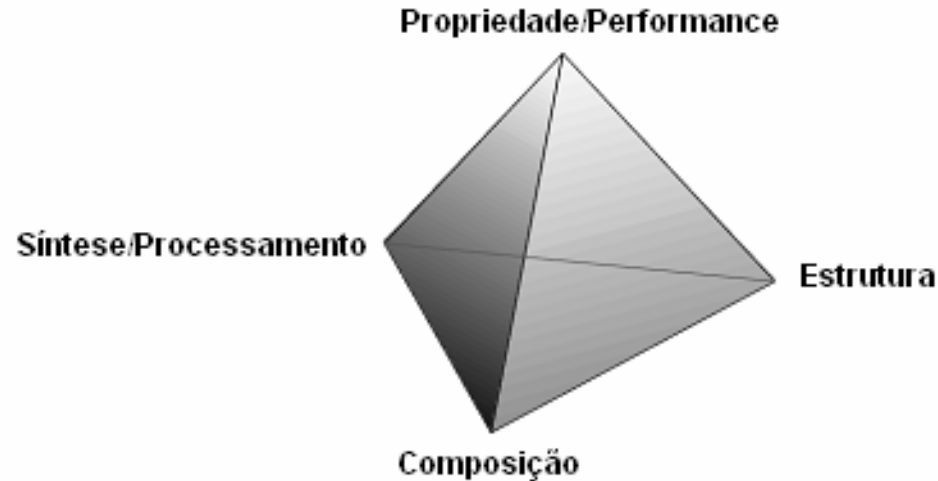
Materials Science and Engineering:

the field devoted to
understanding and controlling
the **performance** of useful solid materials,
through the study of the interrelationships between
materials **synthesis**,
structure,
and **properties**.



- [Materials Science and Engineering](#)
- [Composition](#) means the chemical make-up of a material.
- [Structure](#) means a description of the arrangements of atoms or ions in a material.
- [Synthesis](#) is the process by which materials are made from naturally occurring or other chemicals + [Processing](#) means different ways for shaping materials into useful components or changing their properties.

Tetraedro de Ciência e Engenharia de Materiais



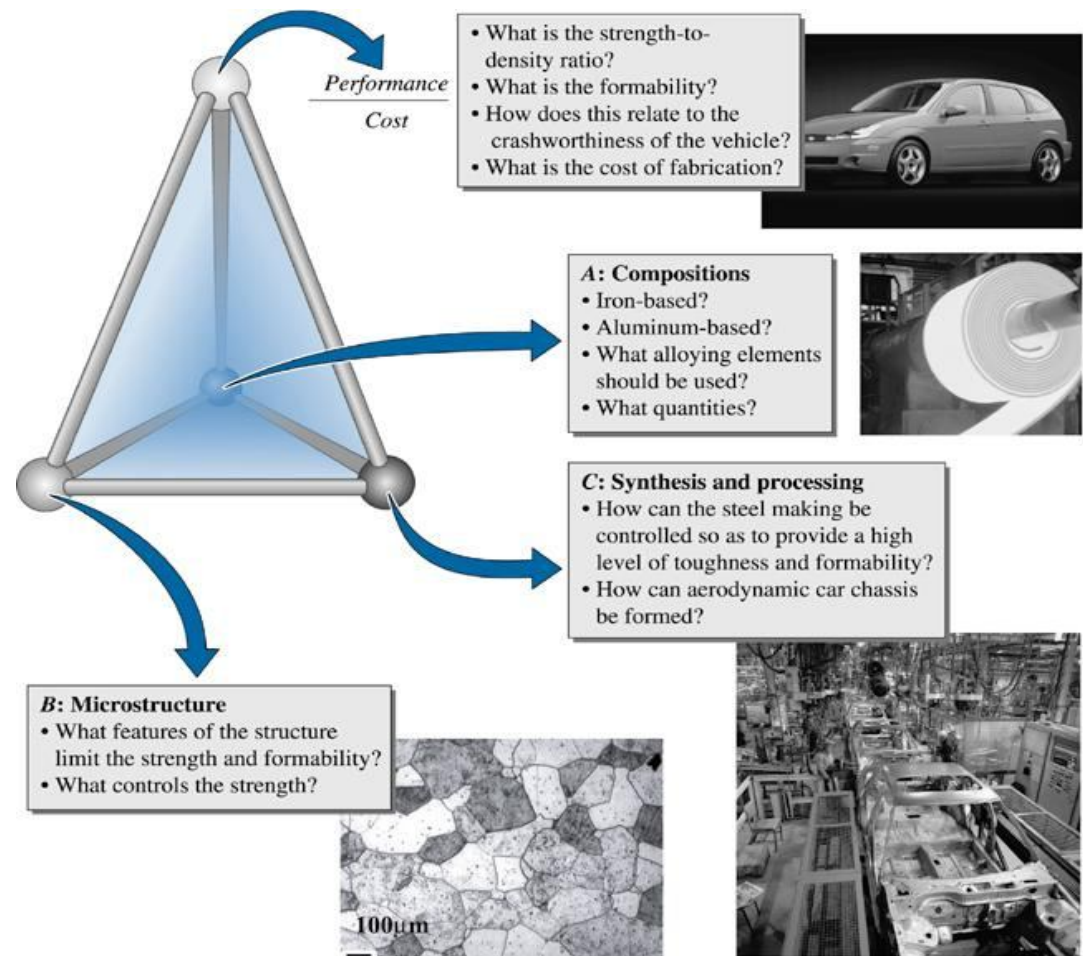
A partir de uma nova necessidade ou concepção em termos de materiais, qual é a melhor opção?

- **Desenvolver novos materiais?**
- **Aperfeiçoar materiais já existentes?**

Tetraedro de Ciência e Engenharia de Materiais

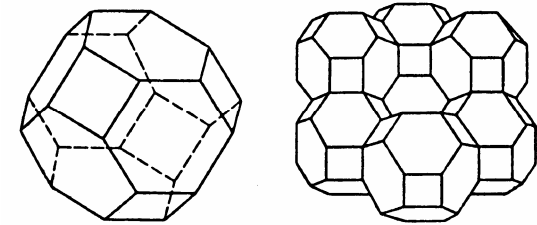
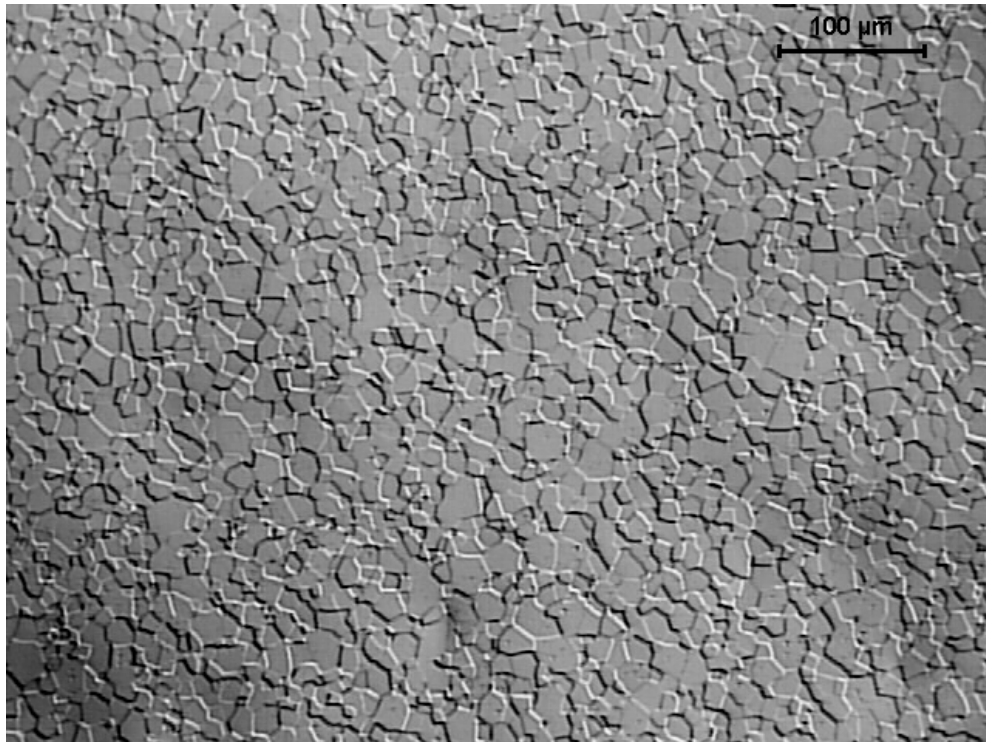
Estudos de casos

Aplicação do Tetraedro de Ciência e Engenharia de Metais

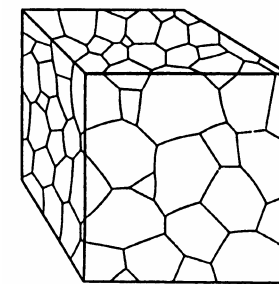


**Desenvolvimento de aços
para fabricação de chassis de automóveis**

Aplicação do Tetraedro de Ciência e Engenharia de Metais

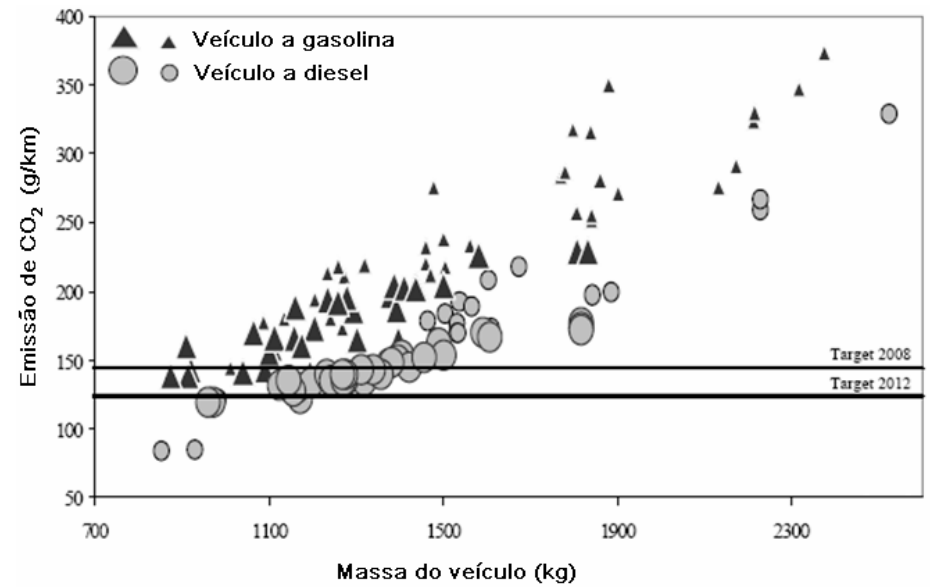
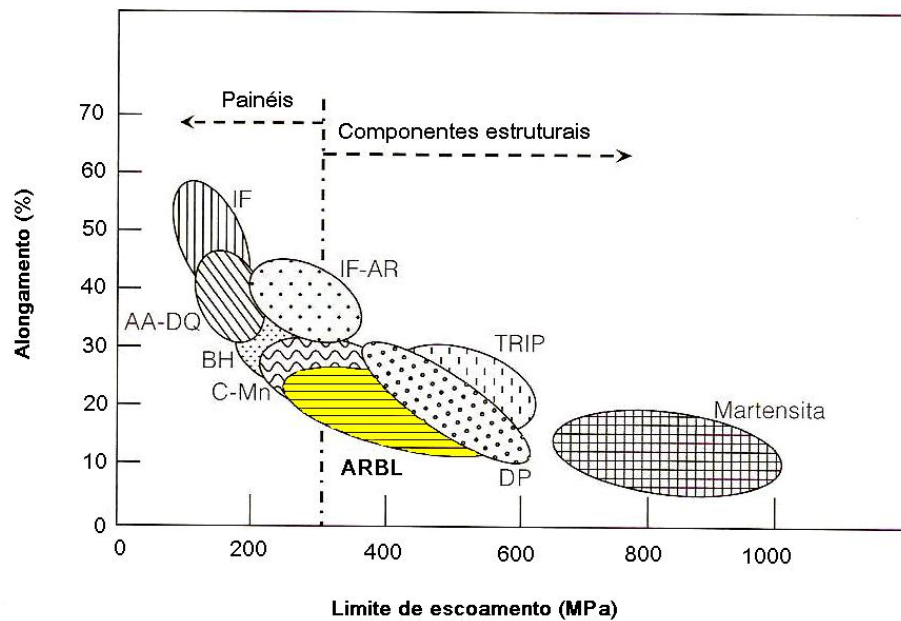


Ortotetracaidecaedro: 24 vértices
36 arestas
14 faces



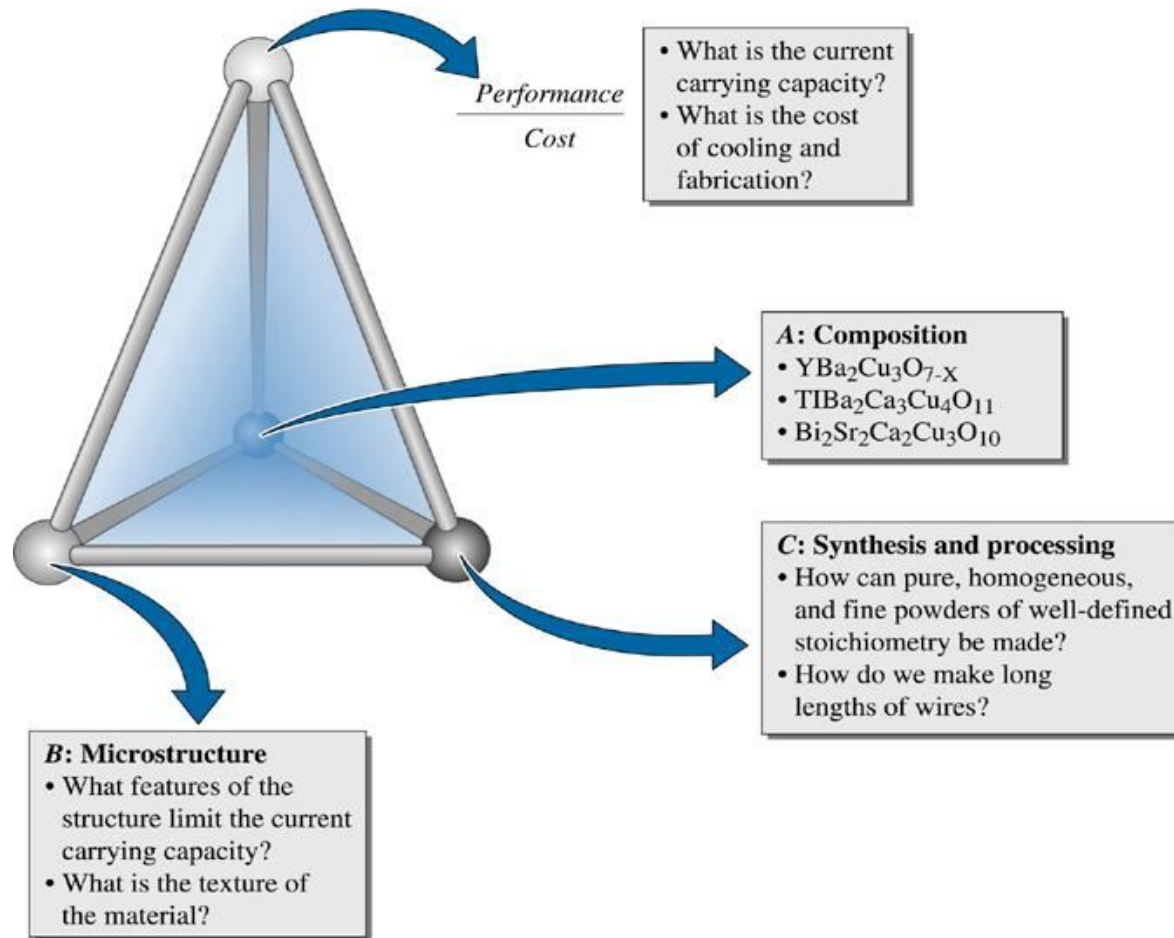
Materiais policristalinos

Aplicação do Tetraedro de Ciência e Engenharia de Metais



Evolução dos aços

Aplicação do Tetraedro de Ciência e Engenharia de Metais



Supercondutores cerâmicos

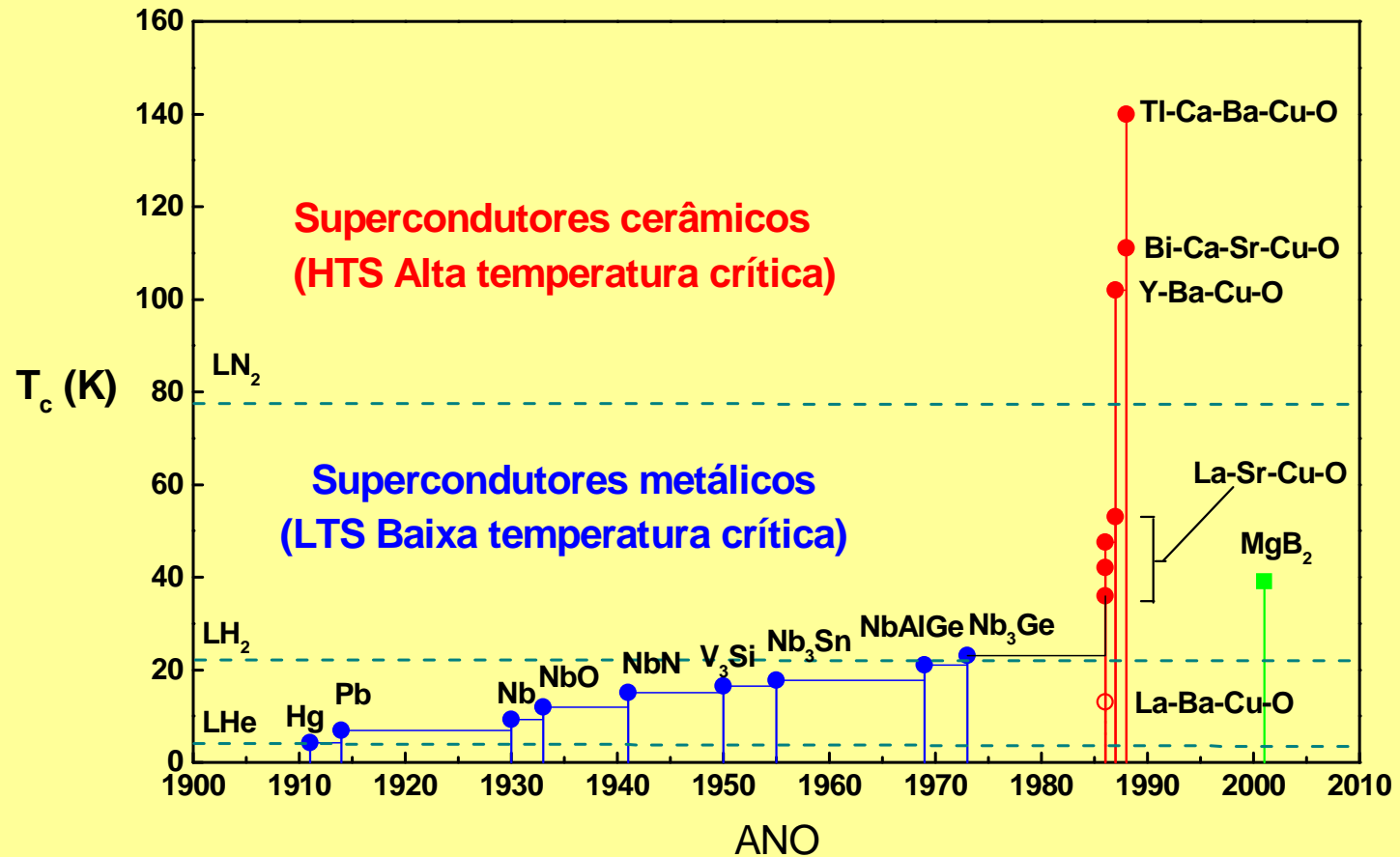
Aplicação do Tetraedro de Ciência e Engenharia de Metais



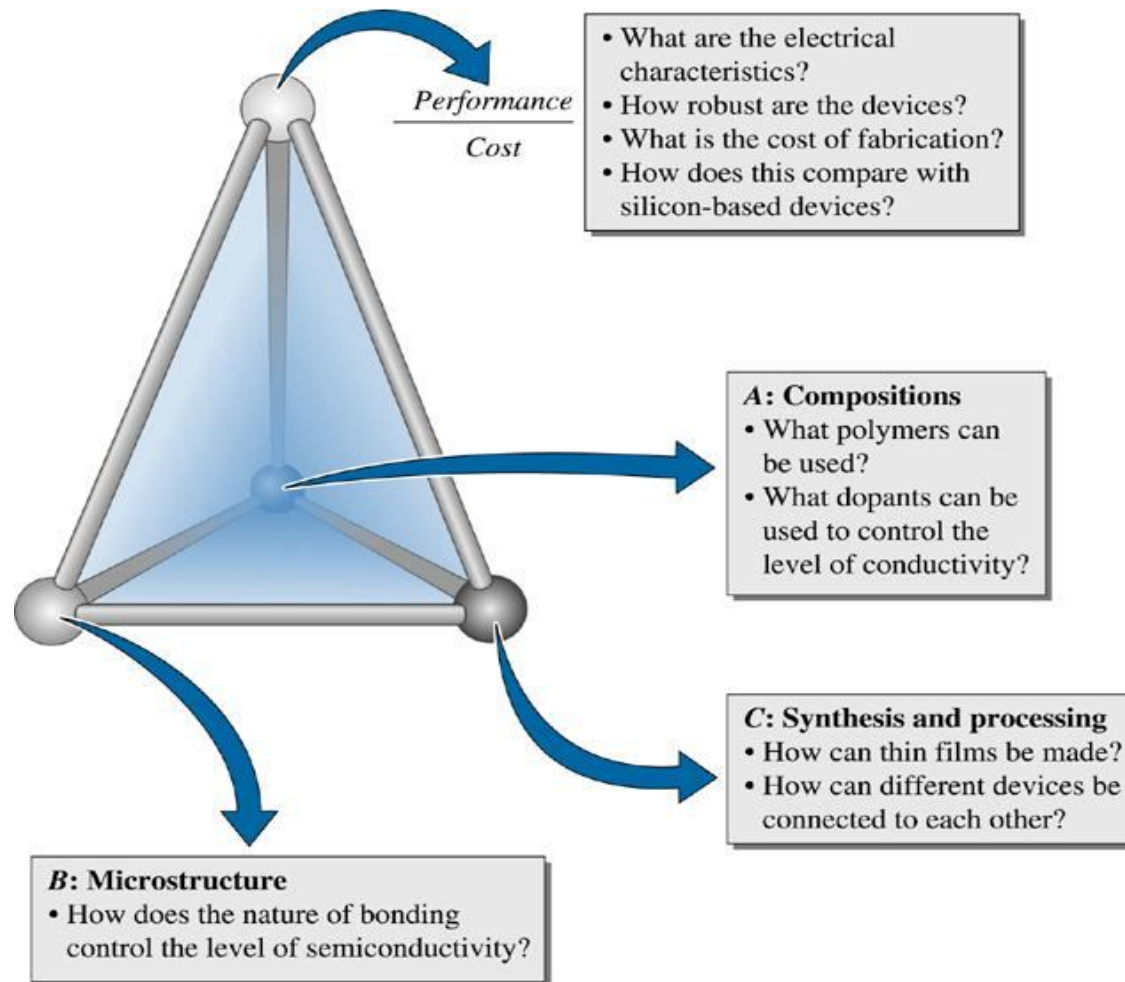
Heike Kamerlingh Onnes
1853-1926, Nobel de Física em 1913

Supercondutividade (Hg, 1911)

Como T_c variou ao longo dos tempos...



Aplicação do Tetraedro de Ciência e Engenharia de Metais



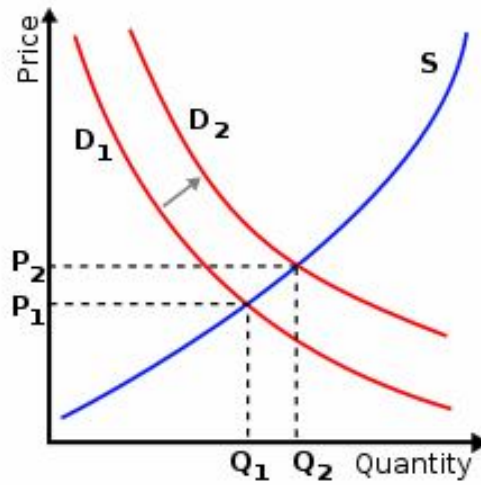
Polímeros semicondutores para uso em eletrônica

Materiais e custo

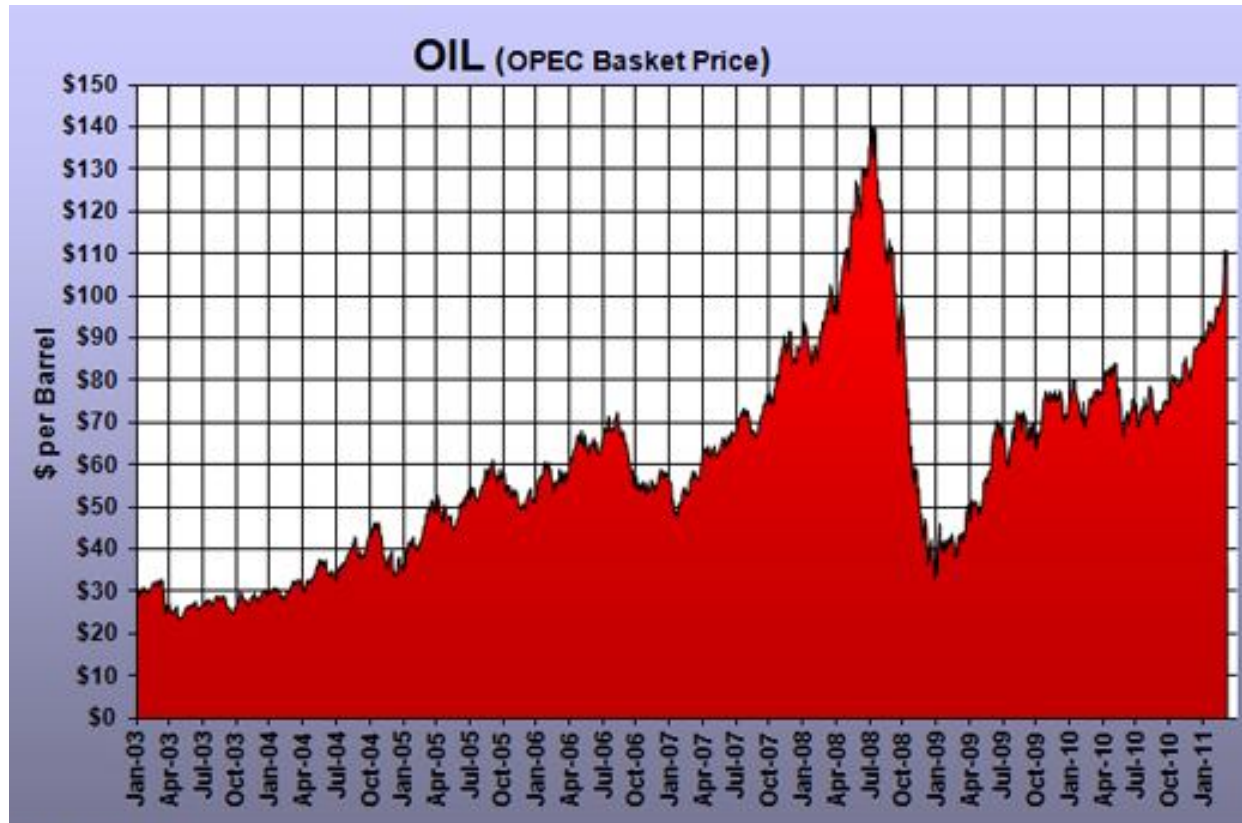
Deve-se escolher um material tendo como critério apenas o “custo”?

Materiais e custo

- Lei da Oferta e da Procura (**Demanda**)
- Economia de Escala



Materials e custo

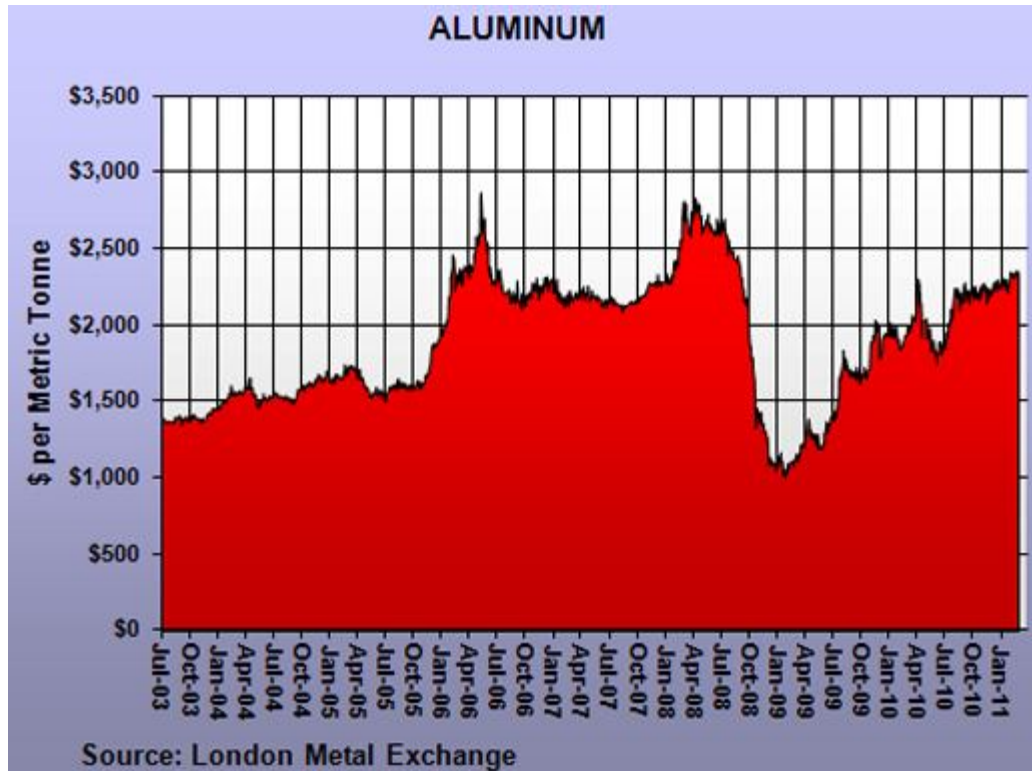


Components

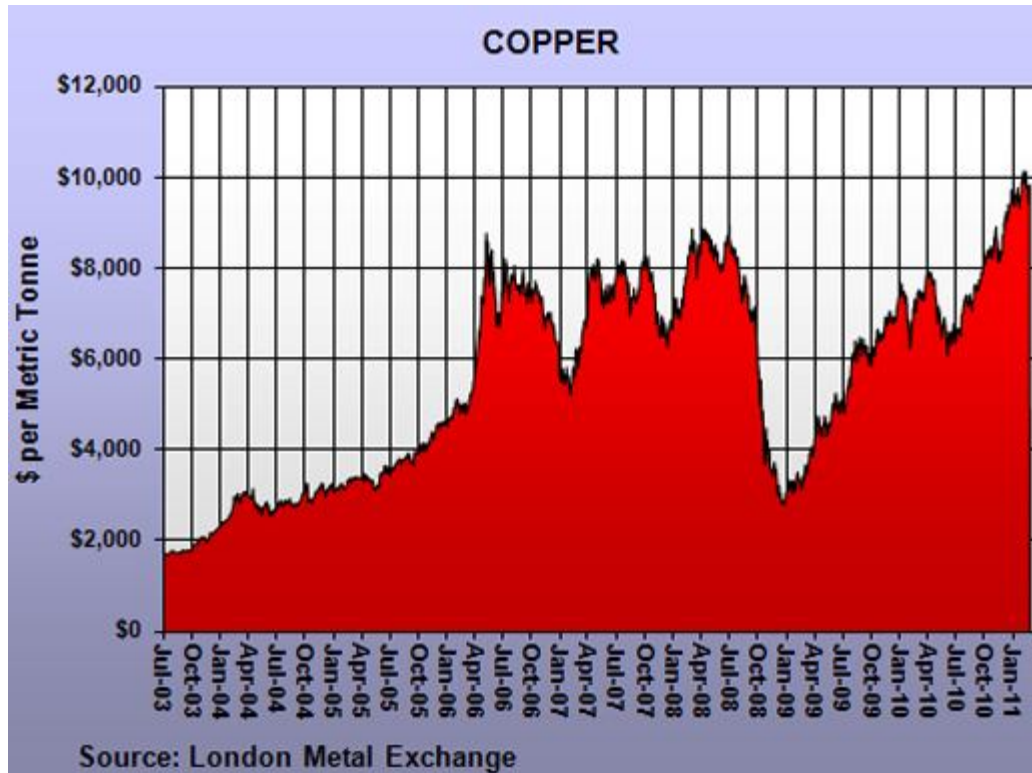
The OPEC Reference Basket comprises: Saharan Blend (Algeria), Minas (Indonesia), Iran Heavy (Islamic Republic of Iran), Basra Light (Iraq), Kuwait Export (Kuwait), Es Sider (Libya), Bonny Light (Nigeria), Qatar Marine (Qatar), Arab Light (Saudi Arabia), Murban (UAE) and BCF 17 (Venezuela).

Energia

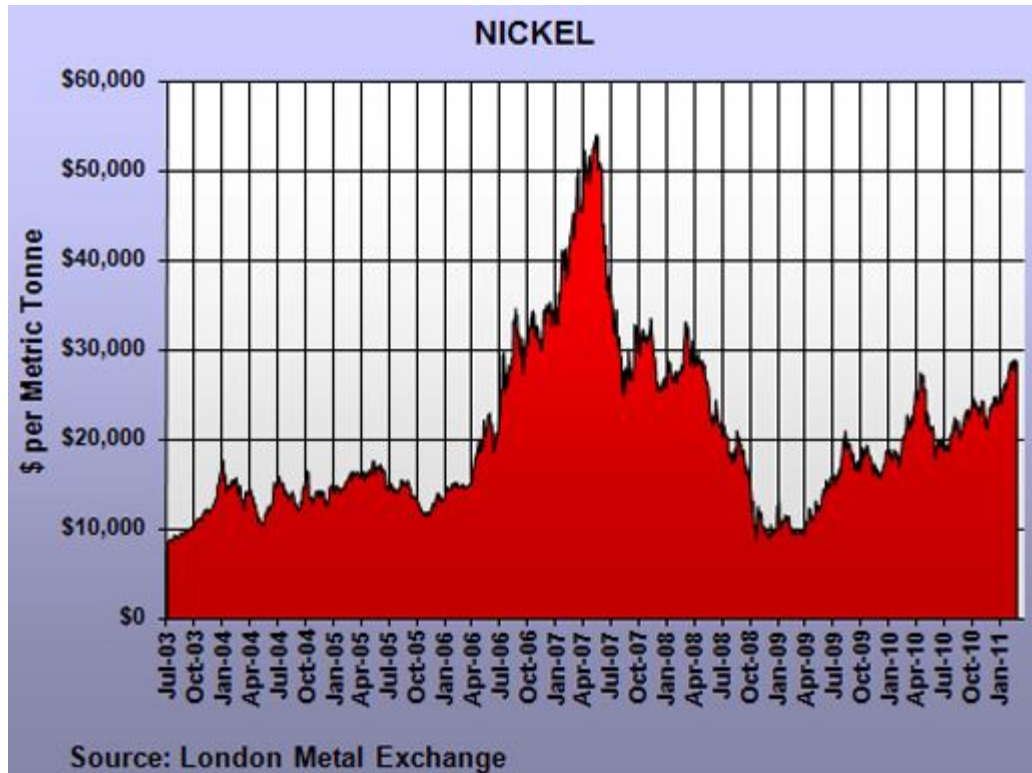
Materials e custo



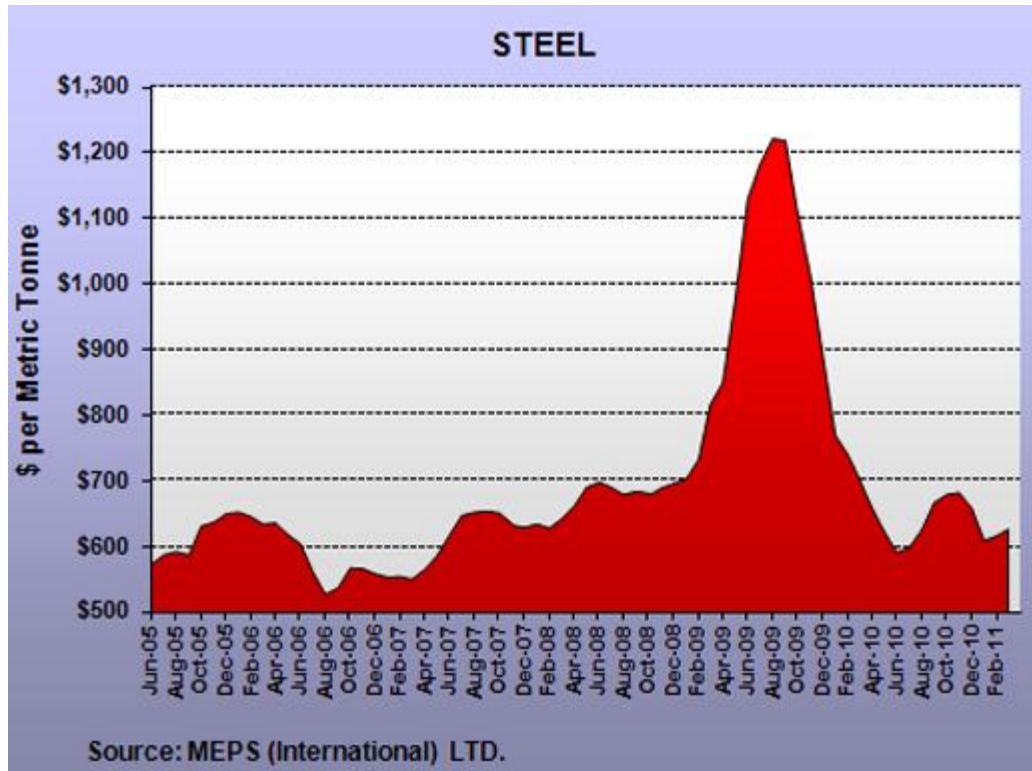
Materials e custo



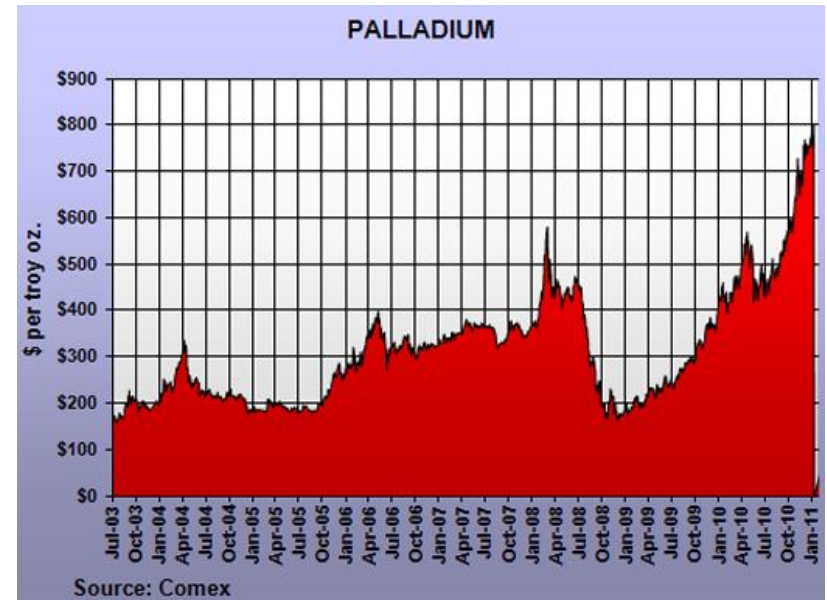
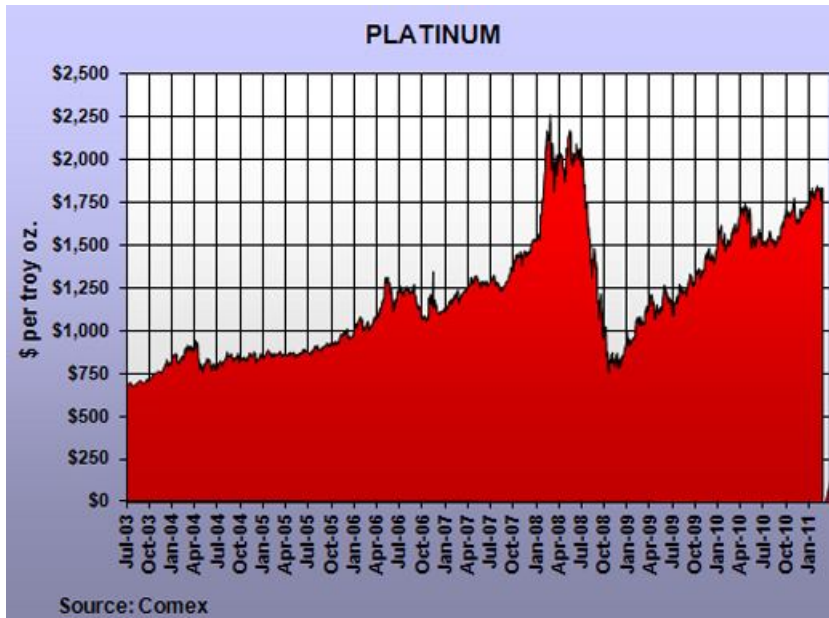
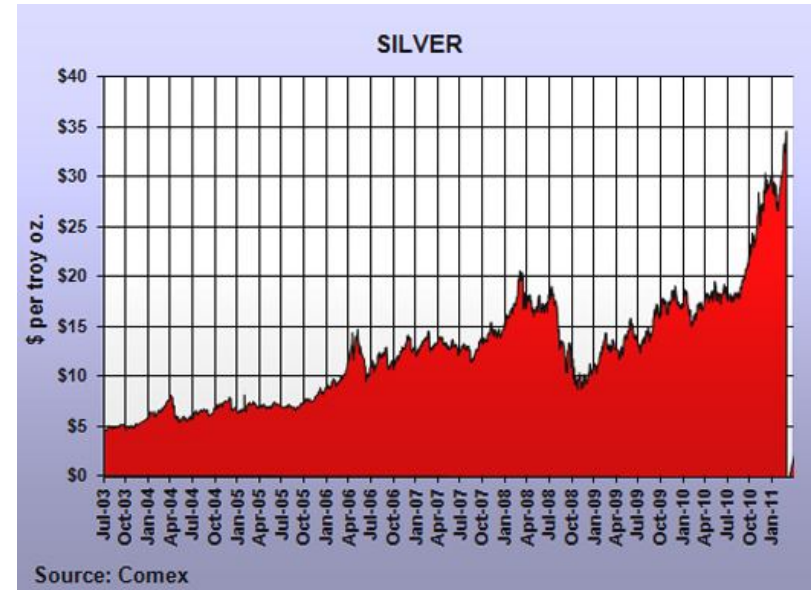
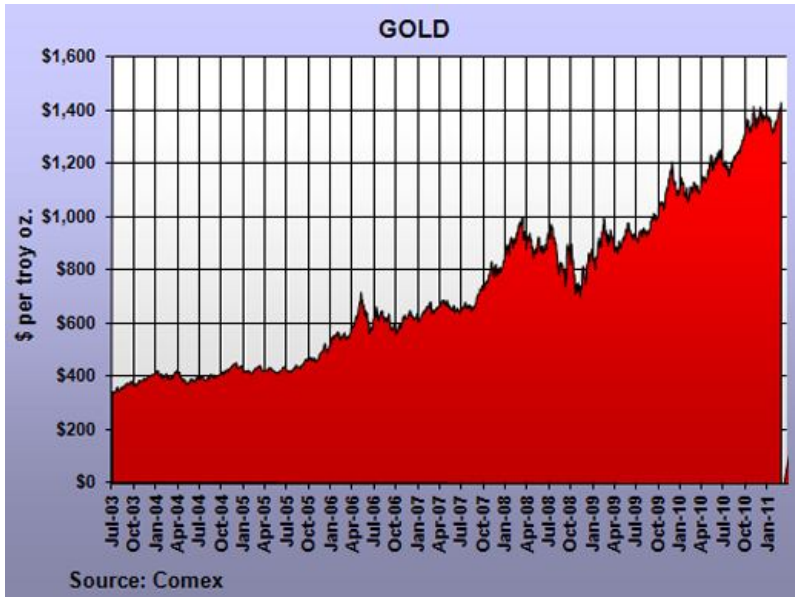
Materials e custo



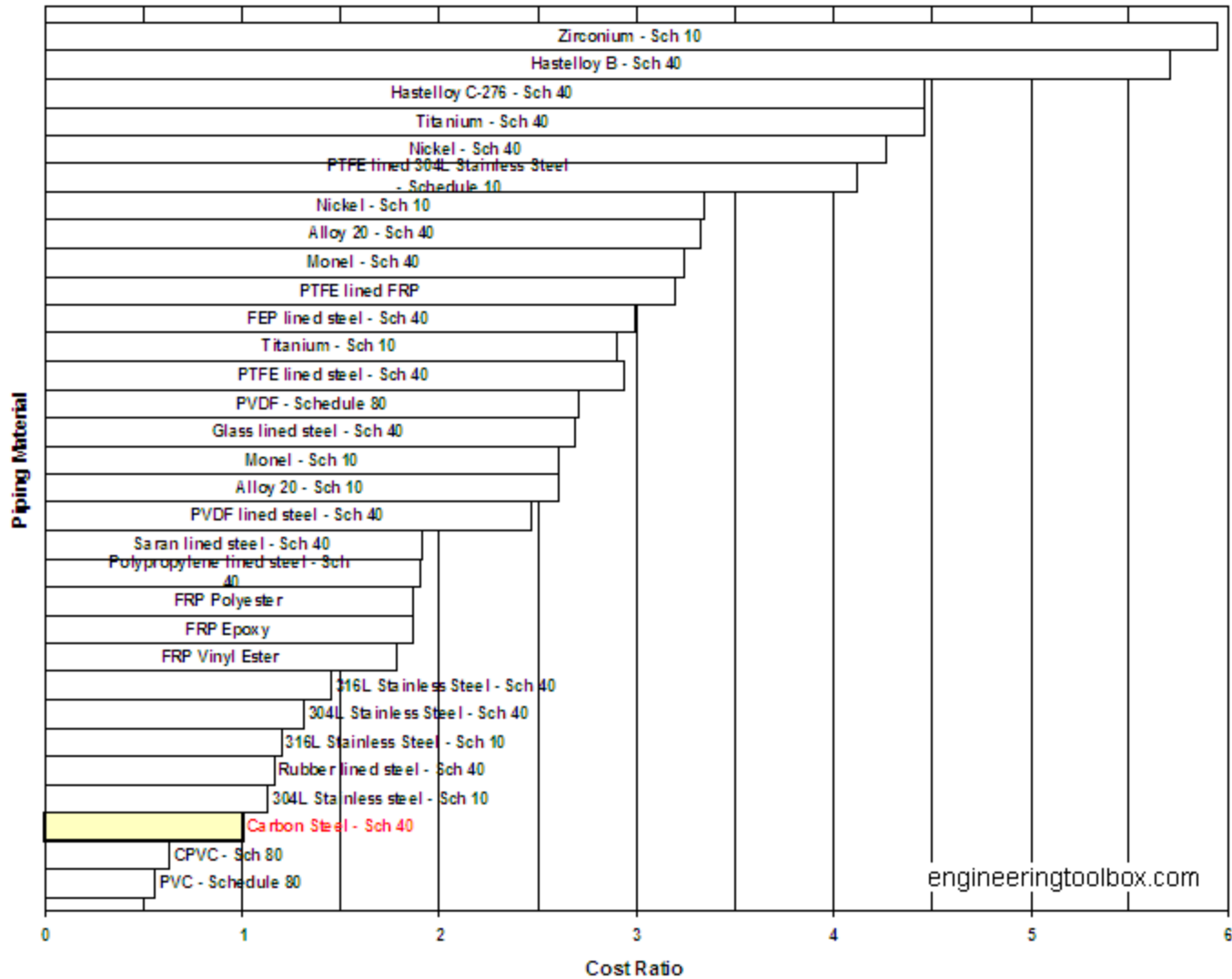
Materials e custo



Materials e custo



Materiais e custo



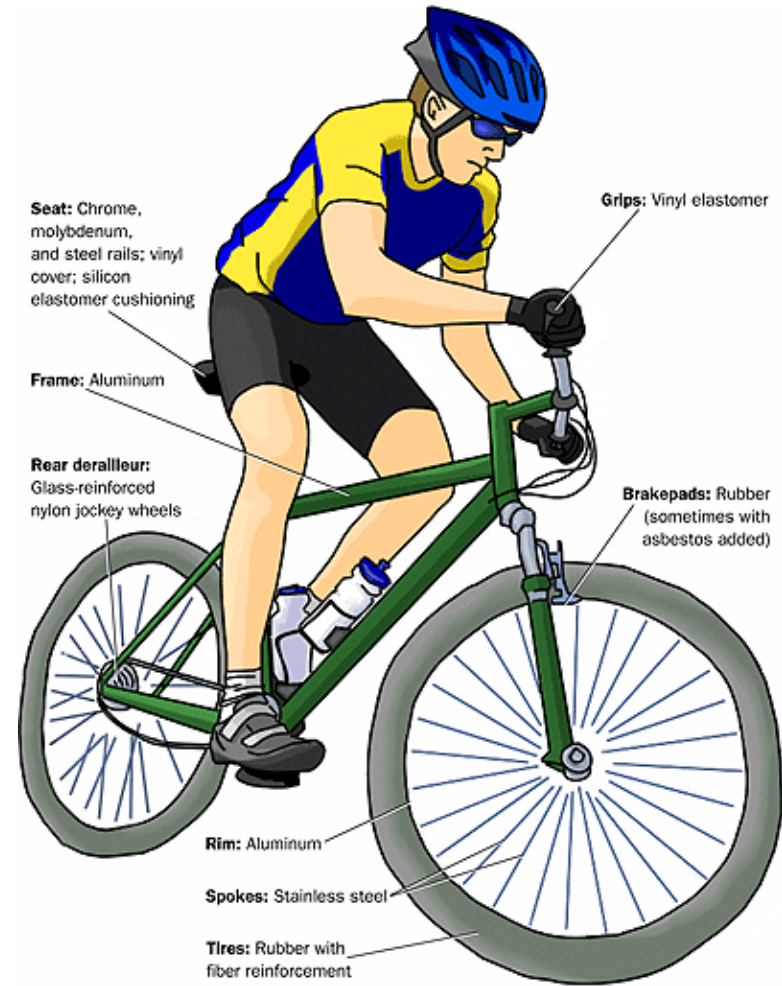
Materiais para tubulações

Materiais e custo



Qual é a melhor?

Materials e custo



Materials e custo



Acta mater. 48 (2000) 359-369



www.elsevier.com/locate/actamat

MULTI-OBJECTIVE OPTIMIZATION IN MATERIAL DESIGN AND SELECTION*

M. F. ASHBY

Department of Engineering, University of Cambridge, Trumpington Street, Cambridge CB2 1PZ, UK

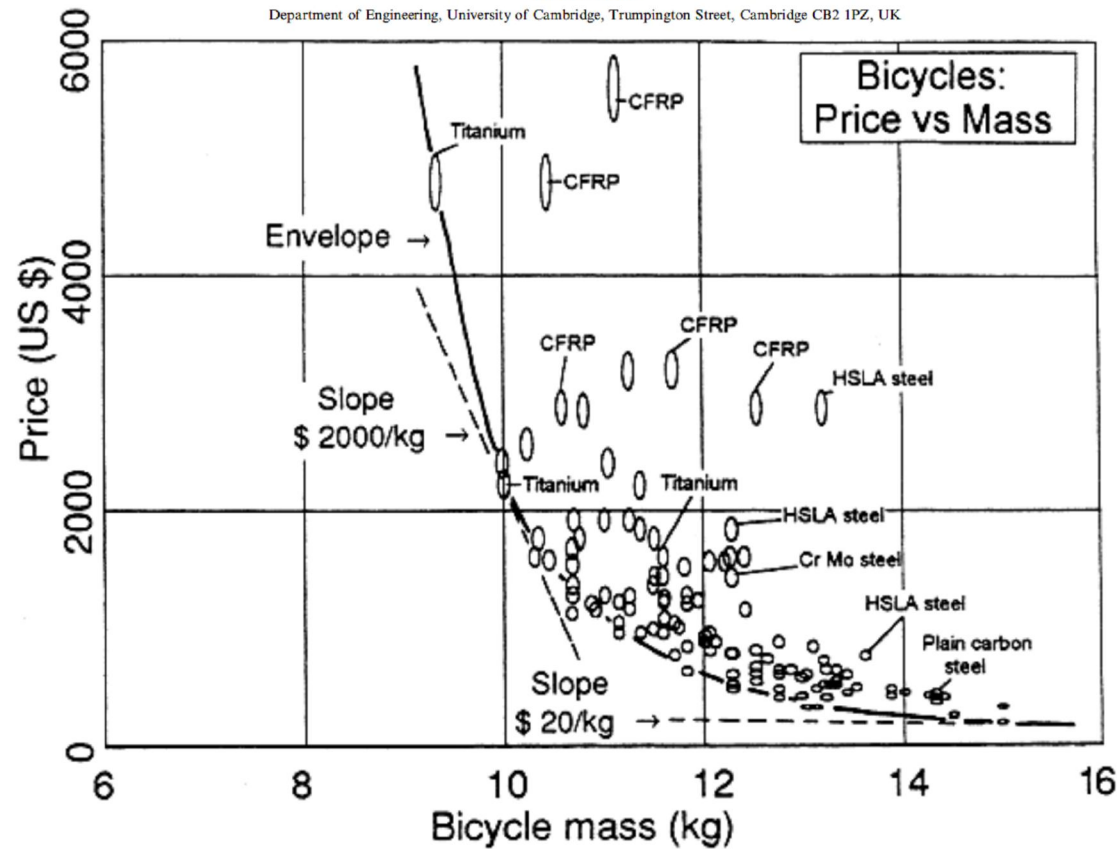


Fig. 6. A plot of price against mass for bicycles. The lower envelope of the data defines a non-dominated or optimal trade-off line. The exchange constant is approximated by the slope of the line. It is low for cheap, heavy bikes, but becomes very large for light, expensive ones.

Materiais e custo

Custo é uma variável importante, mas não a única.

O conjunto de propriedades (derivado da microestrutura), bem como os custos de processamento dos materiais, é que devem nortear a escolha.

**Em Engenharia, deve-se buscar sempre
a melhor solução técnica ao menor custo!**