



# Rare Earths or Lanthanides

2000-2015

## Important Properties



Magnetism



Luminescence



Catalysis

## Rare earths reserves - 2016\*

- 1º China
- 2º Brazil
- 3º Australia

## Extraction of rare earths

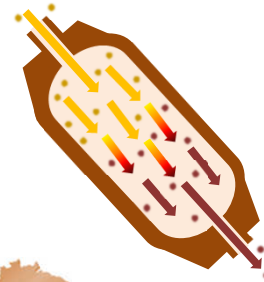
- 1º China
- 2º Australia
- 3º United States of America



Billion \$

Rare earths  
17 Chemical Elements

## Generated products



Catalysts



Paints,  
Solvents



Oil industry



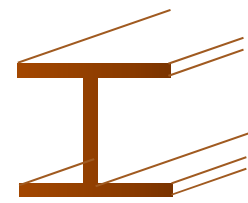
Health imaging



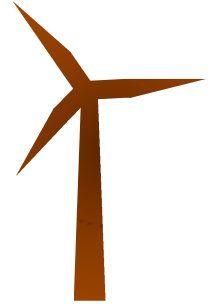
Electronic  
equipment



Hybrid vehicles

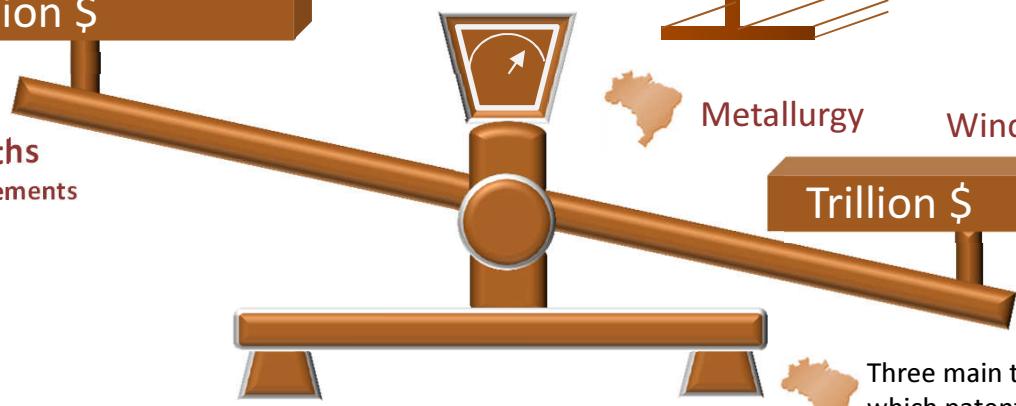


Metallurgy



Wind generators

Trillion \$



Three main technologies for which patent protection is sought in Brazil

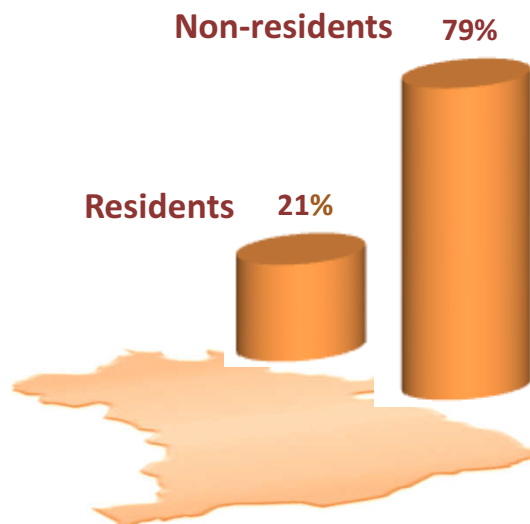
\* USGS Geological Survey (2016)

## Rare Earths or Lanthanides 2000-2015

### Patent applications – Worldwide and in Brazil



### Patent applicants in Brazil



Most of rare earths -related inventions are not patent protected in Brazil.

### Three rare earth elements most cited in the Brazilian patent documentation and some of its applications\*



1º cerium

- Alloys and metallic coatings
- Catalysis



2º lanthanum

- Medical applications
- Metal alloys
- Catalysis



3º yttrium

- Metal alloys
- Catalysis

Cerium, yttrium and lanthanum, in this order, were the most cited elements in the sample (world).

\* The abstracts of patent applications were read.

\*\*Others = Luminescence, radiation, pigment, extraction.