

## 1.2 Introduction to the Course

### 1.2.1 Some General Remarks

So what are "Electronic Materials"? Ask Google and [you get an answer!](#)

Progress in Electrical Engineering was always dependent on progress in materials. For quite some time, electrical engineering meant electro~~mechanical~~ engineering, and electrical products were made from "trivial" materials, as seen from a modern point of view. What was needed were cables, insulators, ferromagnetic sheet metal for transformers and generators, and a lot of metal for the general mechanics. A few applications centered around some mysterious materials - out of that grew *electronics* and electronic materials. But even then there were key materials:

- *Cu wires* of all kinds. Not so trivial - how do you make a insulated but still flexible wire?
- Insulating materials - plastics didn't quite exist yet. **Mica** was one of the key materials - there were mines for it!
- *Graphite* and *tungsten* were important, whenever things got hot, like the filament in the light bulb or in a **vacuum tube**.
- The "tube of **Braun**" - the "*Braunsche Röhre*" as it was known in Europe - the first **cathode ray tube (CRT)** in other words - needed complicated glass work and some *ZnS* as electroluminescent material
- Strange compounds like "*phosphor bronze*" were developed for contacts.
- And **Selenium (Se)** was important for rectifiers, although nobody quite understood how it worked.

The essential break through in the thirties was the **vacuum tube**; with it came electronics: Rectifiers, amplifiers, radio, black-and white **TV**, colour **TV**. It's not that long ago, but obviously long enough for some [not to remember!](#)

The next break-through was called **transistor**; it happened in **1947**. **Integrated circuits** followed around **1970**, and since then we witness exponential growth with growth rates in the complexity of electronics (at constant prices) of [up to 40% a year!](#)

- A good (german) book covering this development in some detail is Hans **Queissers** "*Kristallne Krisen*".