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MATERIAL ANALYZER

Presented By: Ng Shone Fone

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MATERIAL ANALYZER

- X-ray Fluorescence (XRF)
- Optical Emission Spectrometer(OES)

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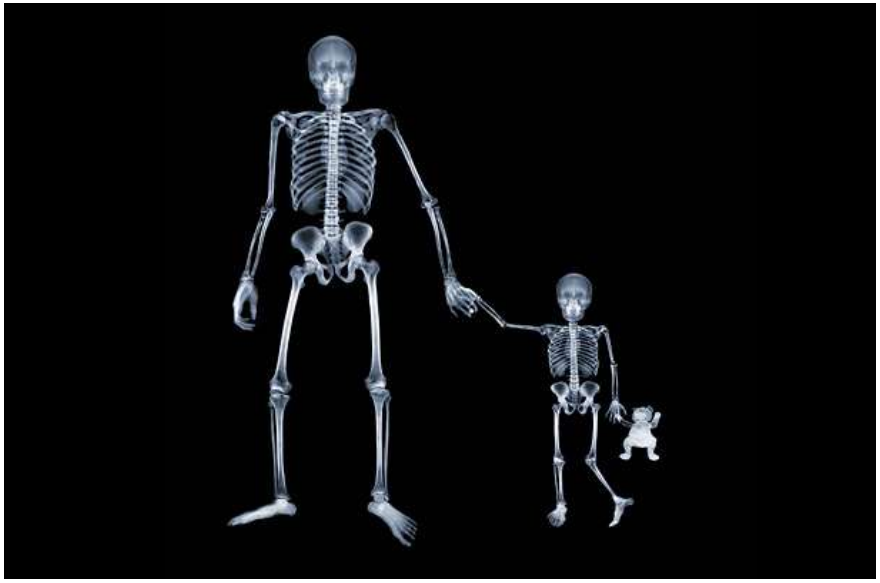
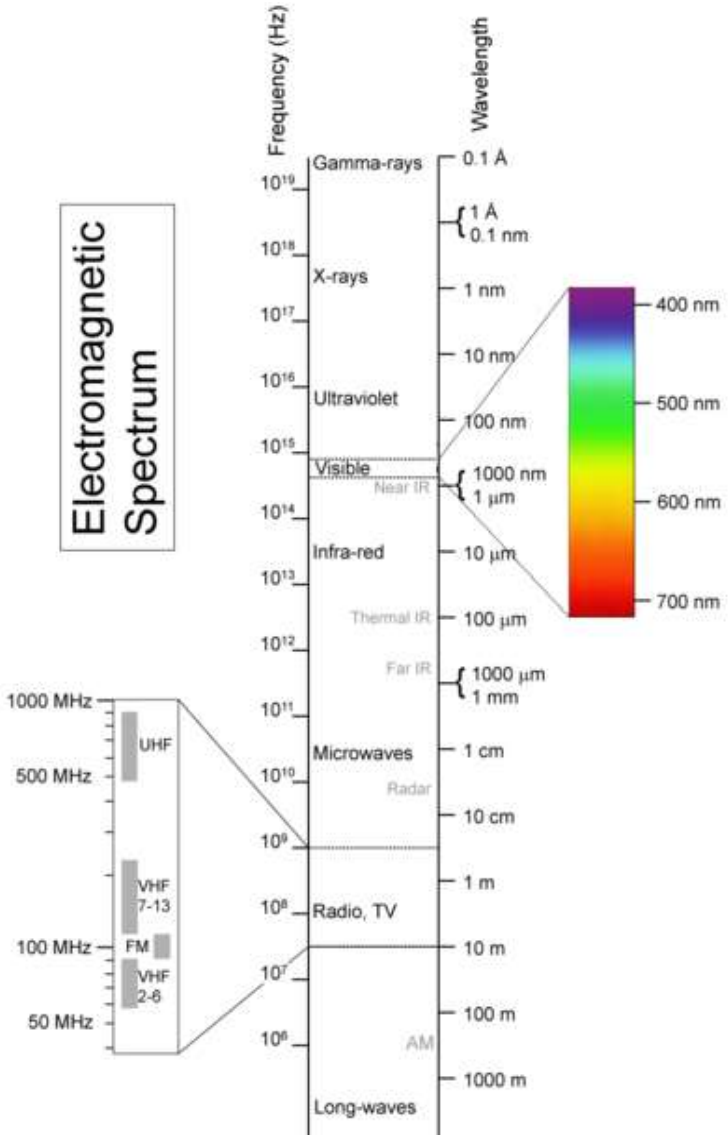
WHAT IS X-RAY??

1.) X-ray is a form of Electromagnetic Radiation.
2.) X-ray have a wavelength in the range Of 0.01 to 10 nanometers.





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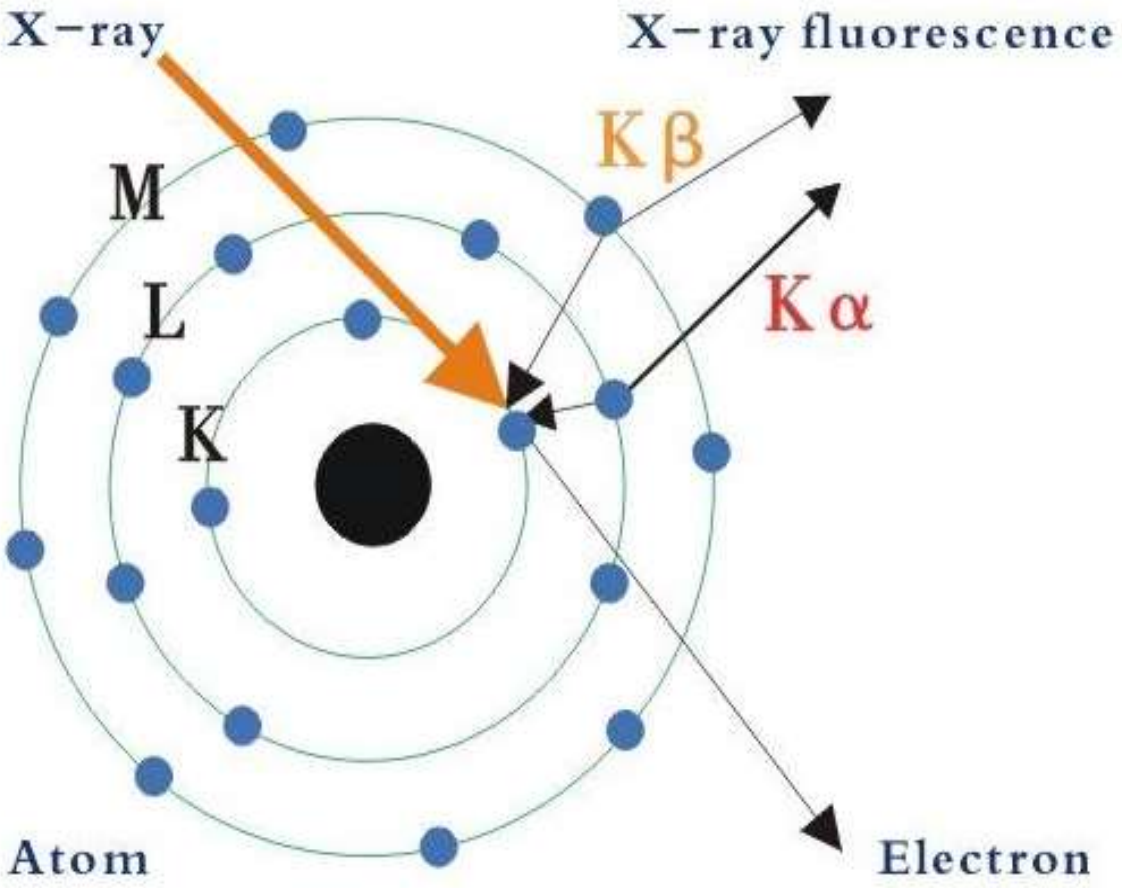
WHAT IS X-RAY FLUORESCENCE (XRF)??



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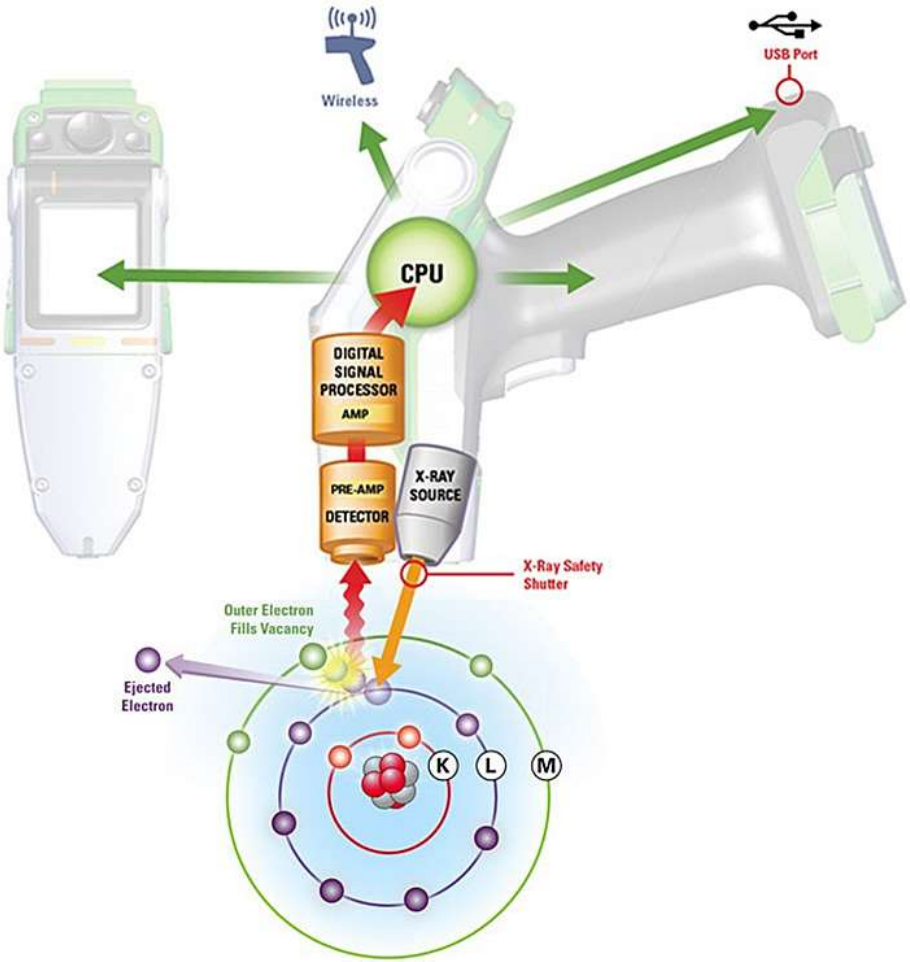
WORKING PRINCIPLE OF THE XRF



X-RAY FLUORESCENCE (XRF)

- Absorption happens when electron in the inner shell is ejected and the empty position is replaced by electron from the outer shells
- Characteristic energies are released during this process
- The characteristic energy is used to identify the element (finger print)
- Absorption process is the basic principle behind the XRF technique

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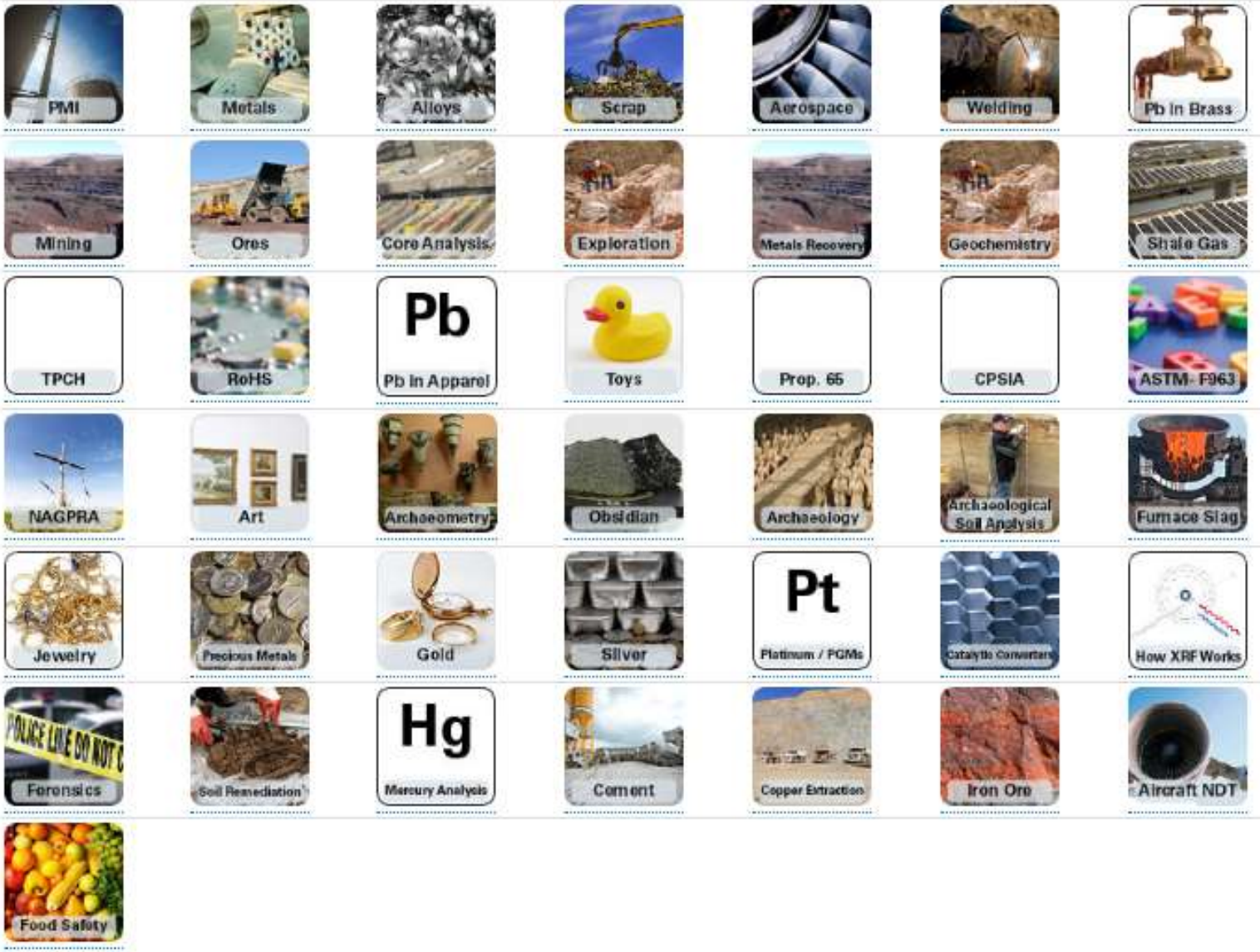

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XRF Screening

Gold analysis at mine face

Sorting scrap

Jewelry

XRF Screening for RoHS

First adopted into law by the European Union as **Directive 2002/95/EC** in 2003 (taking effect in 2006) and was designed **to reduce and restrict the use of various hazardous substances in electronic equipment**

Confirm polymers and plastics in consumer goods and electronics **DO NOT contain restricted toxic elements**.

The **materials** regulated in **RoHS** (Restriction of Hazardous Substances) are **lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (CrVI), polybrominated biphenyls (PBB)** and **polybrominated diphenyl ethers (PBDE)**.


www.aelb.gov.my/malay/index.asp
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Radas Penyinaran
Tolok Ketebalan Bahan Radioaktif
Penyelidikan & Pembangunan
Aktiviti NORM/ TENORM
Sel Penyinaran Kobalt-60
Carigali Minyak & Gas
Reaktor Penyelidikan Nuklear
Anjuran : BKS; Tempat : AELB
(05 - 07 Ogos 2019) Lawatan Teknikal Mobile Source Transit Security System for Malaysia;
Anjuran : BDHL; Tempat : AELB
(07 Ogos 2019) MScN 2019 Satellite Program with UTAR @ SK Batu 14 & SK Batu 7, Kg. Orang Asli Sg. Resak, Tapah, Perak;
Anjuran : UKK; Tempat : Tapah, Perak
(13 Ogos 2019) Lawatan Sambil Belajar daripada Maktab Teknik
SIARAN MEDIA LEMBAGA PERLESENAN TENAGA ATOM
ENG
5:48 AM

Abnormal mutation of cells

Is it safe to travel to Japan to watch Olympic ?

2011 Fukushima nuclear disaster

Harmful radioactive pollutants or radionuclides, such as **iodine-131, cesium-134, cesium-137, strontium-90, and plutonium-238**, among many others.

I-131 decays with a half-life of 8.02 days with beta minus and gamma emissions.

Caesium-137 has a radioactive half life of 30.2 years.

WHOLE ELEMENT ANALYSIS

- Stainless Steel Grade
- Copper
- High Alloy Steel Grade
- Many others

ANALYSIS OF STAINLESS STEEL GRADES

Common Stainless Steel grades:

- Austenitic 300 series
- Ferritic 400 series
- Martensitic 400 series

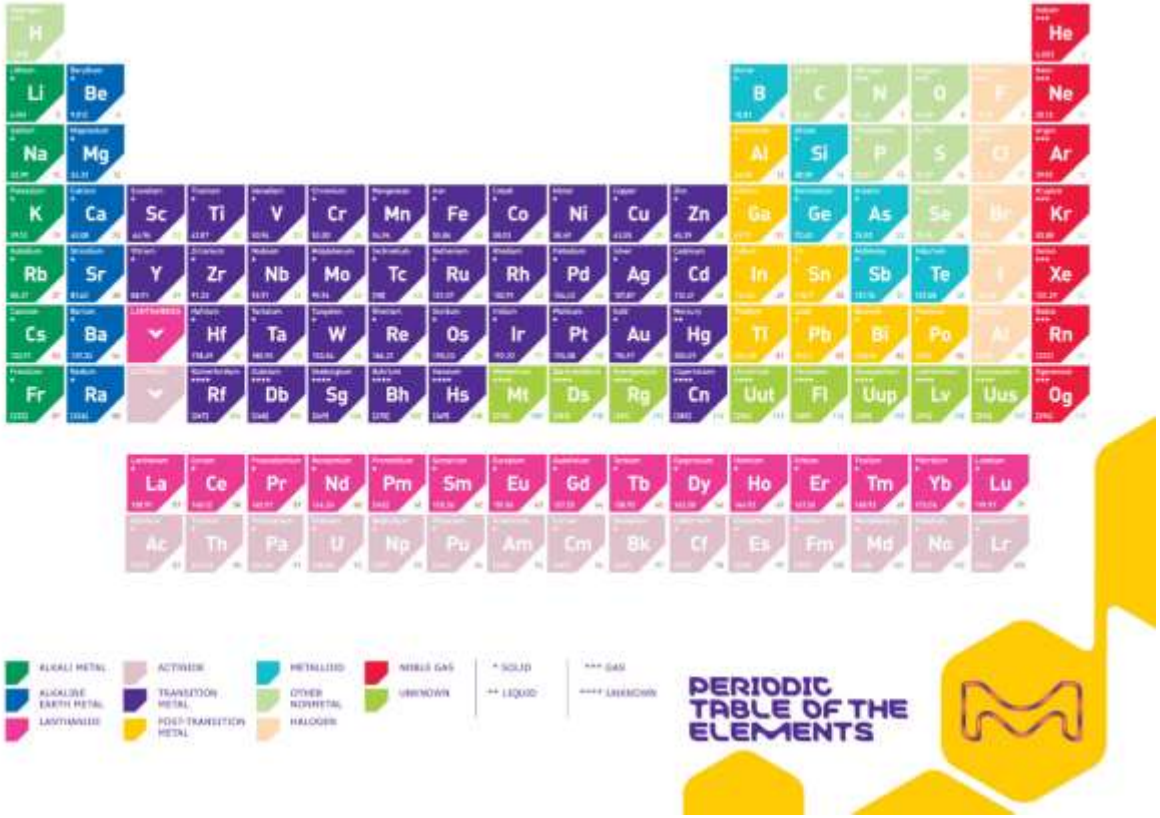
CHEMICAL COMPOSITION OF 300 SERIES

Type	C	Mn	Cr	Ni	Mo
304	Max 0.08	Max 2	18-20%	8-10.5%	-
316	Max 0.08	Max 2	16-18%	10-14%	2-3%
317	Max 0.08	Max 2	18-20%	11-15%	3-4%
321	Max 0.08	Max 2	17-19%	9-12%	0.75%
347	Max 0.08	Max 2	17-19%	9-12%	0.5-0.75%

Chemical Composition of 400 Ferritic & Martensitic series

Type	C	Mn	Cr	Ni	Mo
410	Max 0.15	Max 1	11.5-13.5%	0.2-0.55%	0.2-0.55%
410S	Max 0.08	0.3-0.65%	12-12.6%	-	-
416	Max 0.15	Max 1.25	12-14%	-	-
420	Min 0.15	Max 1	12-14%	-	-
430	Max 0.15	Max 1	16-18%	-	-
440	0.95-1.2%	Max 1	16-18	-	Max 0.75%

ELEMENTAL IDENTIFICATION

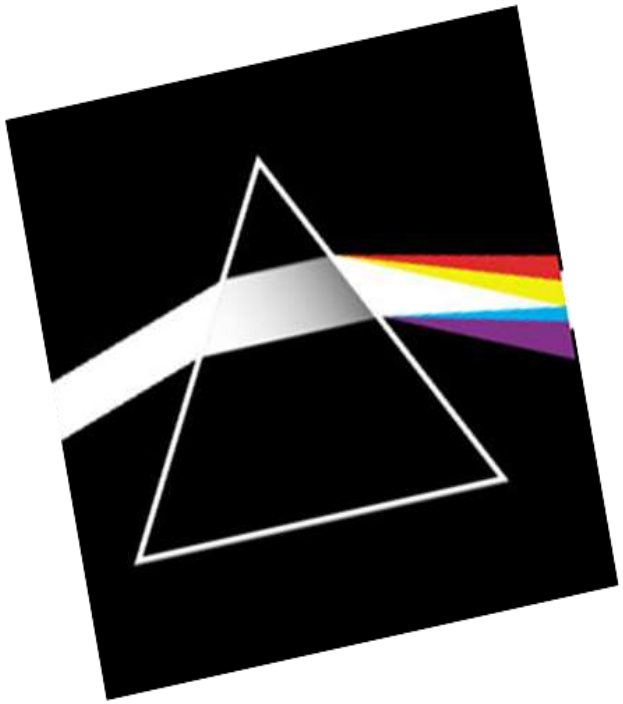


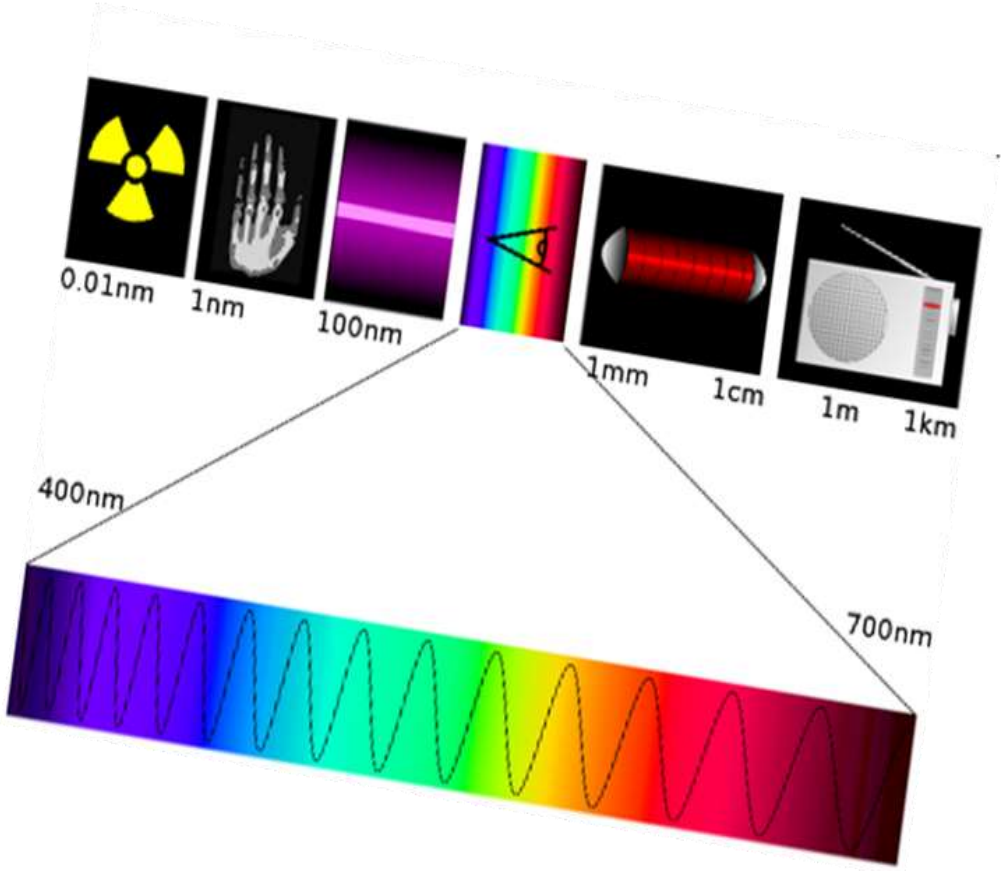
XRF method Can analyze most elements in steel with the exception of Carbon, Sulfur and Phosphorus

OPTICAL EMISSION SPECTROMETER (OES)

- OES provide fast and simple analysis on solid conductive sample.
- OES analysis grants good accuracy and precision
- OES technique gives the possibility to analyze almost every elements belonging to periodic table
- OES method satisfy all different metallurgic industry needs: process control, quality control, incoming material, PMI positive material identification

WORKING PRINCIPLE OF OES

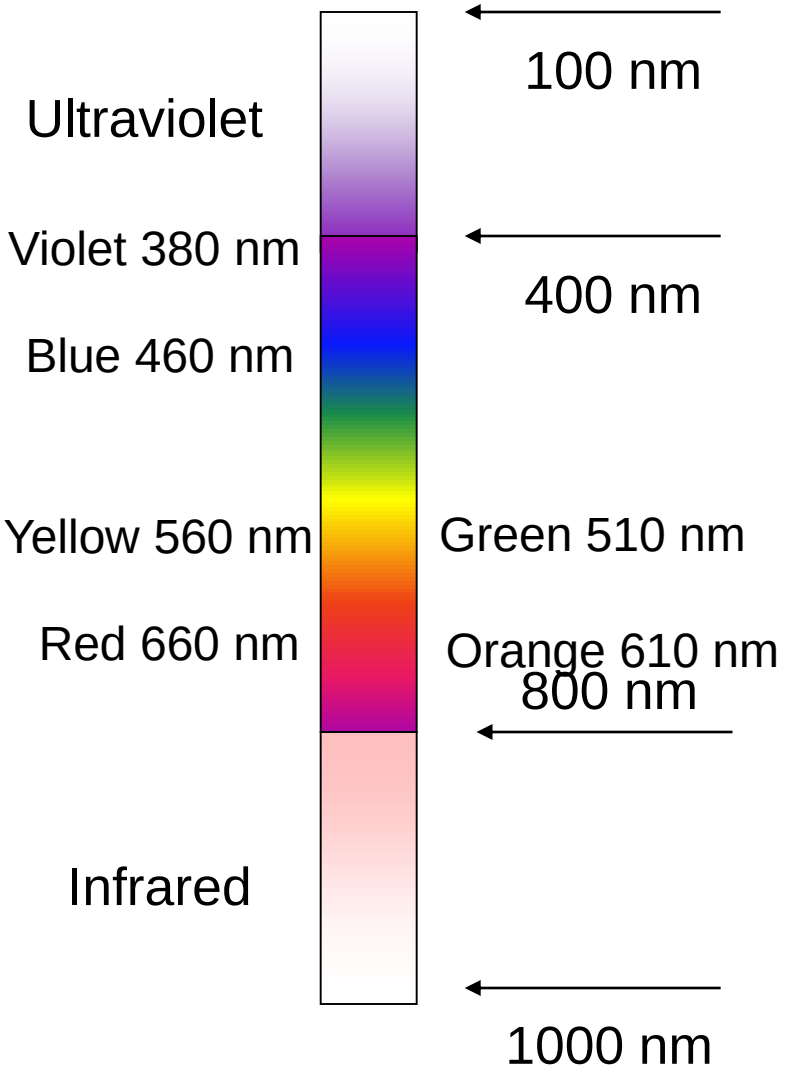




WORKING PRINCIPLE OF OES

The Light Spectrum

- The human eye is only able to see the spectral colours in the rainbow.
- Beside the visible part of the spectrum, the light spectrum has areas of „waves“ the human eye can not determine.
- Only spectrometers are able to observe the entire range.



WORKING PRINCIPLE OF OES

Source and Ignition

Power

Sample

Polychrome light

Light Emission

The light is reflected and separated by the diffraction grating. The spectra appears on the Rowland Circle.

Diffraction Grating, works similar like a prism

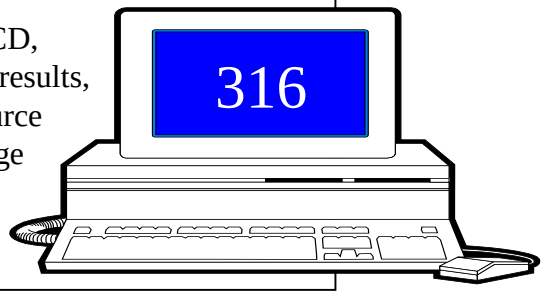
CCD for the readout of the light-intensity

Readout of the Intensity, calculation of the results

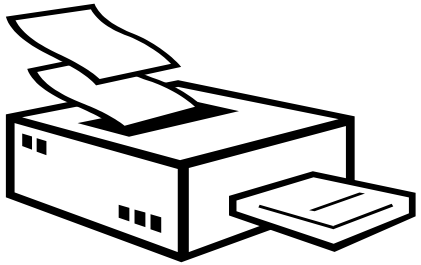
Steering of the source

Computer

Readout of the CCD, calculation of the results, steering of the source and printout/storage of the data



Printout or storage of data

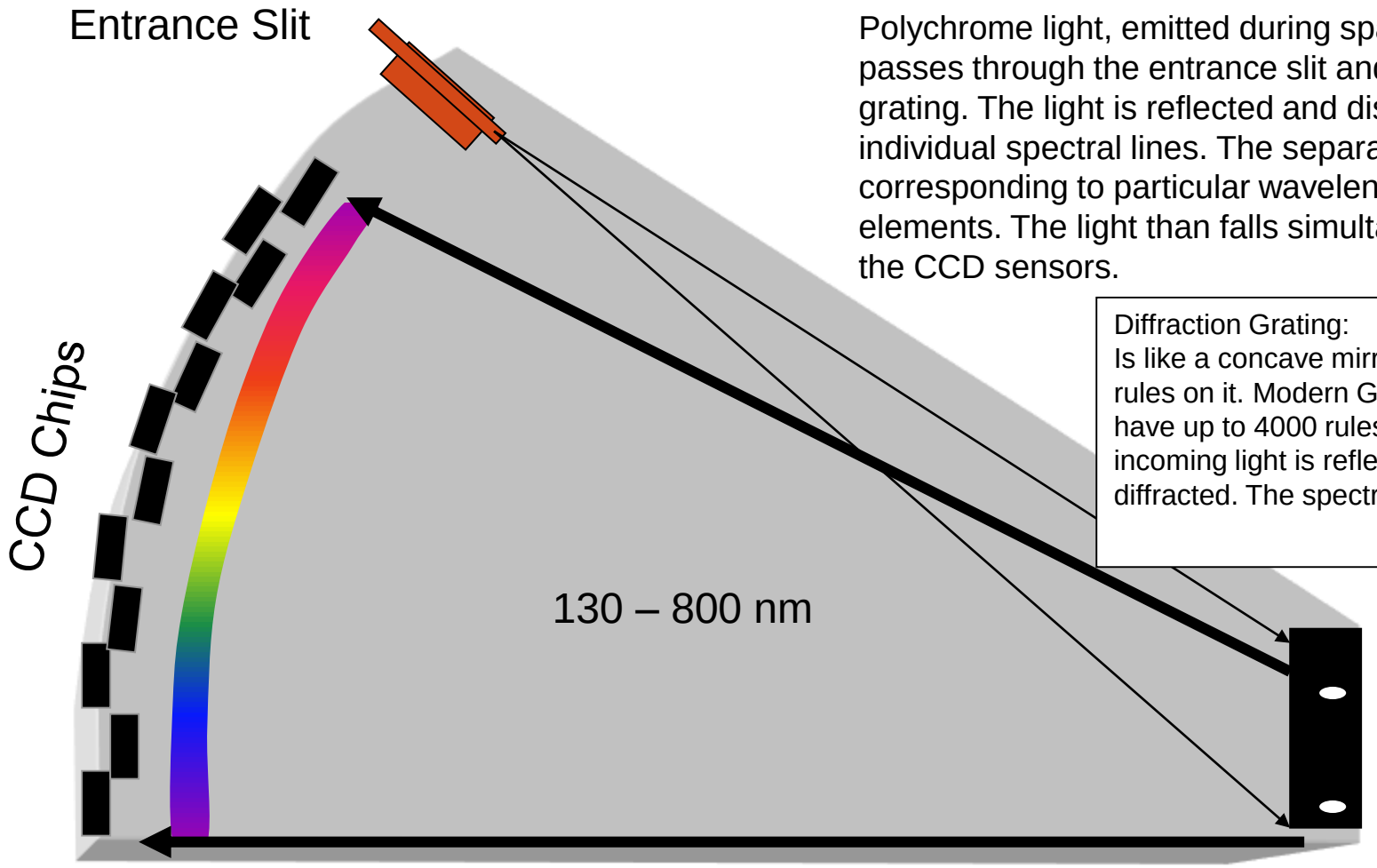


Sample of OES after measurement

The Reasons of Using Argon Gas

- Argon is an inert gas and won't react with the elements in the alloy during the sparking period.
- Isolate the atmosphere by flushing the surface so that the spectrometer won't detect the elements in the atmosphere.
- Spectrometer can detect the element, which has its characteristic peak below the wavelength 200nm correctly.
- In the composition of alloy, the element Argon is not ignored.
- Price of Argon is relatively inexpensive, typically, the price of inter gases from cheapest one to most expensive one:
- Argon <Helium < Neon < Krypton or Xenon

SCHEMATIC VIEW OF OPTICAL SYSTEM



Polychrome light, emitted during spark process, passes through the entrance slit and falls on the grating. The light is reflected and dispersed into individual spectral lines. The separated light is corresponding to particular wavelength of elements. The light than falls simultaneously on the CCD sensors.

Diffraction Grating:
Is like a concave mirror, but with rules on it. Modern Gratings have up to 4000 rules/mm. The incoming light is reflected and diffracted. The spectra appears.

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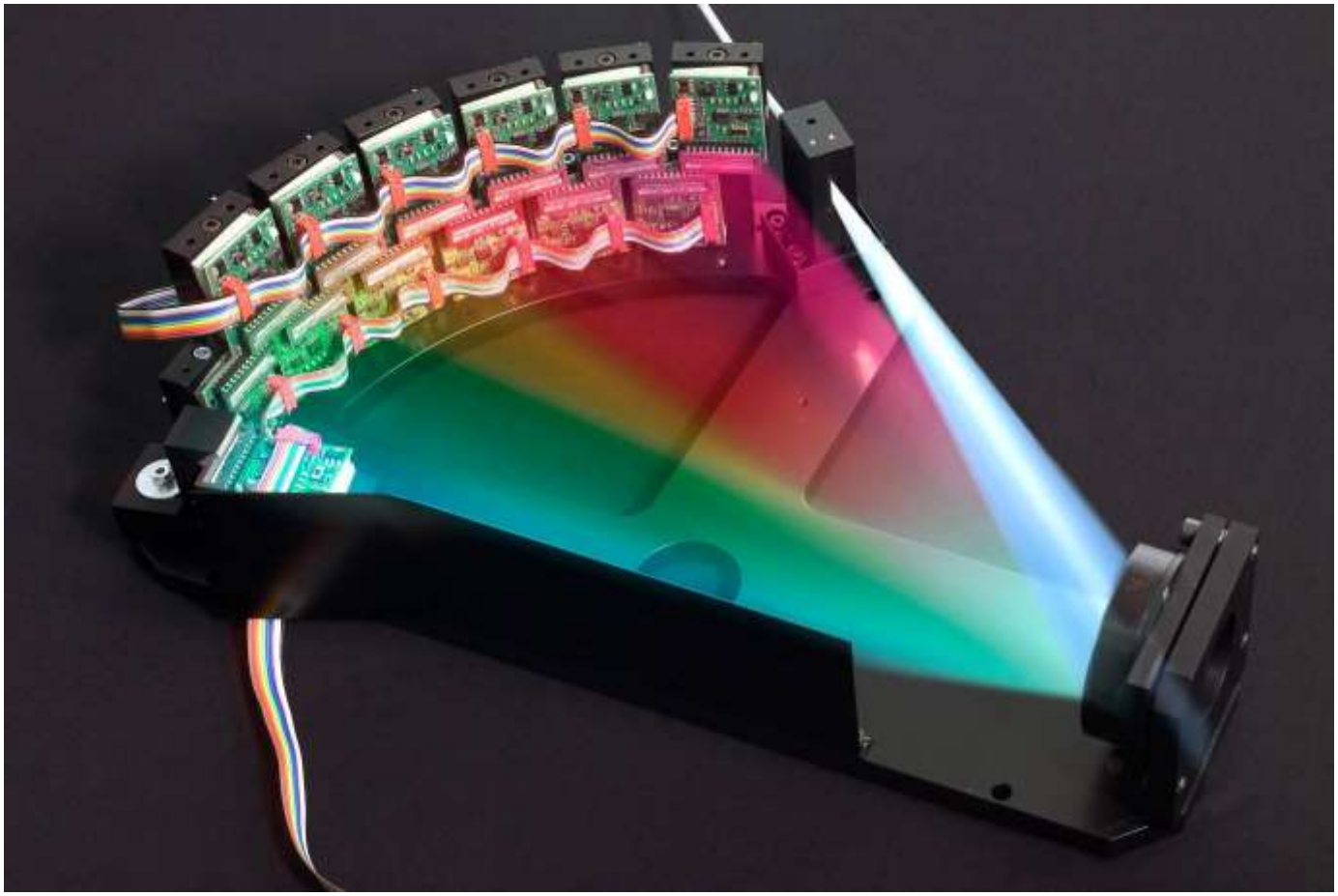
IT IS ALL ABOUT LIGHT, WAVELENGTH AND PEAKS



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Which one is more accurate?


Q&A


Thank
you!!