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Neutron Technique in civil security applications

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Non-destructive analysis (NDA) of materials is a well-known technique applied in several fields of bulk material analysis. It is a wide group of analysis techniques used in science and technology industry to evaluate the properties of a material, component or system without causing damage.

In particular, we will focus on neutron based technique, like PGNAA (Prompt Gamma Neutron Activation Analysis), PFNA (Pulsed Fast Neutron Analysis), PFTNA (Pulsed Fast/Thermal Neutron Analysis), API (Associated Particle Imaging), FNGT (fast neutron and gamma transmission).

These techniques have big application potential since they could provide data about large number of elements simultaneously and non-destructively together with valuable imaging and elemental information. For example in industrial applications (oil, coke, concrete..) and environmental research (soil moisture, snow..).

In recent years significant and rapid developments in technologies such as the neutron sources and detectors together with still increasing computer power make possible to take the full advantage of this techniques and significantly broaden usage of neutron analysis in many different applications.

Neutron interrogation techniques generally rely on bombarding the nuclei in the interrogated object with neutrons of particular energy or energies, causing them to emit characteristic γ -rays or alter the energy or the direction of the interrogating neutrons.

A general overview of the neutron interactions will be presented, together with the main components of these techniques such as neutron sources, detectors and data analysis. Then, we will focus our attention on civil security examples using neutrons, for illicit threats, explosive and more general smuggling in airlines security screening and cargo container inspections.

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