International Standard



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Metallic and non-metallic coatings - Measurement of thickness — Beta backscatter method

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3543 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in May 1978.

It has been approved by the member bodies of the following countries :

Australia Czechoslovakia Egypt, Arab Rep. of France Germany, F.R. Hungary India Israel Italy Japan Mexico South Africa, Rep. of

Sweden Switzerland United Kingdom USA USSR

No member body expressed disapproval of the document.

Metallic and non-metallic coatings — Measurement of thickness — Beta backscatter method

1 Scope and field of application

This International Standard specifies a method for the nondestructive measurement of coating thicknesses using beta backscatter gauges. It applies to both metallic and non-metallic coatings on both metallic and non-metallic substrates. To employ this method, the atomic numbers or equivalent atomic numbers of the coating and the substrate must differ by an appropriate amount.

CAUTION — Beta backscatter instruments used for the measurement of coating thicknesses employ a number of different radioactive sources. Although the activities of these sources are normally very low, they can present a hazard to health, if incorrectly handled. Therefore, all rules and regulations of local or national authorities must be observed.

2 Definitions

For the purpose of this International Standard, the following definitions apply.

2.1 radioactive decay : A spontaneous nuclear transformation in which particles or gamma radiation are emitted or X-radiation is emitted following orbital electron capture or in which the nucleus undergoes spontaneous fission.*

2.2 beta particle : An electron, of either positive or negative charge, which has been emitted by an atomic nucleus or neutron in a nuclear transformation.*

2.3 beta-emitting isotope; beta-emitting source; beta emitter : A material the nuclei of which emit beta particles.

It is possible to classify beta emitters by the maximum energy level of the particles which they release during their disintegration. **2.4** electron-volt : A unit of energy equal to the change in energy of an electron in passing through a potential difference of 1 V. (1 eV = $1,602 \ 10 \times 10^{-19} \ J$)*

Since this unit is too small for the energies encountered with beta particles, the mega-electronvolt (MeV) is commonly used.

2.5 activity : The number of spontaneous nuclear disintegrations occurring in a given quantity of material during a suitably small interval of time divided by that interval of time.*

Therefore, in beta backscatter measurements, a higher activity corresponds to a greater emission of beta particles.

The SI unit of activity is the becquerel (Bq). The activity of a radioactive element used in beta backscatter gauges is generally expressed in microcuries (μ Ci) (1 μ Ci = 3,7 × 10⁴ Bq, which represents 3,7 × 10⁴ disintegrations per second).

2.6 half-life, radioactive : For a single radioactive decay process, the time required for the activity to decrease to half its value by that process.*

2.7 scattering : A process in which a change in direction or energy of an incident particle or incident radiation is caused by a collision with a particle or a system of particles.*

2.8 backscatter : Scattering as a result of which a particle leaves a body of matter from the same surface at which it entered.

NOTE — Radiations other than beta rays are emitted or backscattered by a coating and substrate and some of these may be included in the backscatter measurement. Whenever the term "backscatter" is used in this International Standard, it is to be assumed that reference is made to the total radiation measured.

^{*} Definition taken from ISO 921, Nuclear energy glossary.