



Standard Practice for Dosimetry in Radiation Processing¹

This standard is issued under the fixed designation E2628; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—An editorial change was made to the title in December 2009.

INTRODUCTION

The use of ionizing radiation for the treatment of commercial products such as the sterilization of medical devices, the reduction of microbial contamination in food or the modification of polymers is referred to as radiation processing. The types of radiation used may be gamma radiation (typically from cobalt-60 sources), X-radiation or accelerated electrons.

It is necessary to ensure that the specified absorbed dose is applied in each of the radiation processing applications. The absorbed dose must be measured, and measurement systems have been developed for this purpose. Much of the development of these systems rests on the early development of dosimetry systems for personnel radiation protection and for medical treatment. However, the absorbed doses used in radiation processing are generally higher, ranging from ~10 Gy up to 100 kGy or more and new dosimetry systems have been developed for measurements of these doses.

Note that the terms “dose” and “absorbed dose” are used interchangeably in this standard (see 3.1.1).

The dose measurements required in radiation processing concern characterization of radiation facilities in installation qualification (IQ) and operational qualification (OQ), measurement of dose distribution in irradiated products in performance qualification (PQ) and routine monitoring of the irradiation process.

The literature is abundant with articles on dosimeters for radiation processing, and guidelines and standards have been written by several organizations (the International Atomic Energy Agency (IAEA) and the International Commission on Radiation Units and Measurements (ICRU), for example) for the operation of the dosimetry systems and for their use in the characterization and validation of the radiation processing applications. In particular, **ICRU Report 80** provides information on the scientific basis and historical development of many of the systems in current use.

ASTM Subcommittee E10.01 on Radiation Processing: Dosimetry and Applications was formed in 1984 initially with the scope of developing standards for food irradiation, but its scope was widened to include all radiation processing applications. The subcommittee has under its jurisdiction approximately 30 standard practices and standard guides, collectively known as the E10.01 standards on radiation processing. A number of these standards have been published as ISO/ASTM standards, thereby ensuring a wider international acceptance. These practices and guides describe the dosimetry systems most commonly used in radiation processing, and the dose measurements that are required in the validation and routine monitoring of the radiation processes. A current list of the E10.01 standards on radiation processing is given in 2.1 and 2.2.

The development, validation and routine control of a radiation process comprises a number of activities, most of which rely on the ability to measure the delivered dose accurately. It is therefore necessary that dose is measured with traceability to national, or international, standards, and the uncertainty is known, including the effect of influence quantities. The E10.01 standards on radiation processing dosimetry serve to fulfill these requirements.

The practices describing dosimetry systems have several common attributes, and there is a need to have one general standard that can act as a common reference and that can be used as a basis for the selection of dosimetry systems for defined tasks. Practice E2628 serves this purpose. It outlines general requirements for the calibration and use of dosimetry systems and for the estimation of