



BSI Standards Publication

Preparation of metallographic specimens

National foreword

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Preparation of metallographic specimens

Confection des éprouvettes métallographiques



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Foreword

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Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Preparation of metallographic specimens

1 Scope

This document presents a list of common practices in preparation methods of metallographic specimens for optical and scanning electron microscopy, including preliminary preparation, grinding and polishing of specimens as well as microstructure revelation methods covering the optical method, etching methods (chemical, electrolytic, constant potential, ion sputtering and high temperature relieving) and the interface layer method [1][2].

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Preliminary preparation

4.1 Selection of metallographic specimens

4.1.1 General

Because the metallographic examination serves a specified purpose that differs from case to case, there is no one single way to select and prepare specimens. However, it is the accepted state of the art to select specimens that are representative of the material that is being studied. The location, type of section and number of the specimens to be studied are usually dictated by the manufacture method of metals, examination intent or purpose, related standards or agreement upon enquiry.

4.1.2 General studies or routine work

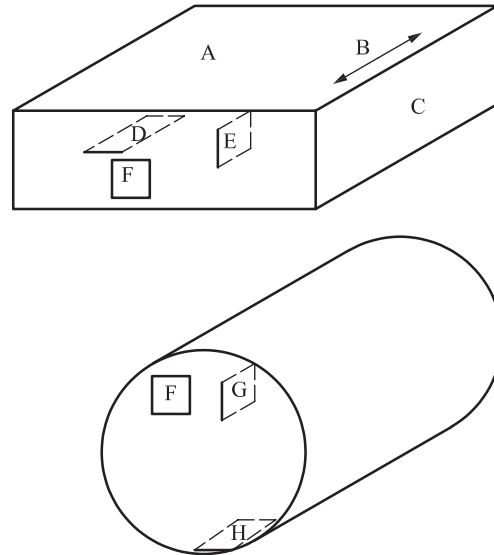
Specimens are generally chosen from locations most likely to reveal the maximum variations within the material under study [3]. For example, specimens could be taken from a casting in the zones wherein maximum segregation might be expected to occur as well as specimens from sections where segregation could be at a minimum [4]; in the examination of strip or wire, test specimens are often taken from each end of the coils [5]; heat or surface treated specimens are often taken so as to include all the heat or surface treated layers [6]; welding specimens often incorporate the welding seam, heat affected zone and base metal [7].

4.1.3 Study of failures

In nearly all situations, test specimens are taken as closely as possible to the fracture or to the initiation of the failure. Before taking the metallographic specimens, study of the fracture surface is completed, or at the very least, the fracture surface is documented [8]. In many cases, specimens are taken from a sound area for a comparison of structures and properties.

4.2 Selection of type of section to be examined

4.2.1 Having established the location of the metallographic samples, the type of section to be examined is decided. The locations of surfaces examined are always given in reporting results and in any illustrative micrographs. A suitable method of indicating surface locations is shown in [Figure 1](#).



Key

- A rolled surface
- B direction of rolling
- C rolled edge
- D planar section
- E longitudinal section perpendicular to rolled surface
- F transverse section
- G radial longitudinal section
- H tangential longitudinal section

Figure 1 — Method of designating location of area shown in photomicrograph [9]

4.2.2 Transverse sections or cross sections (Surface F) taken perpendicular to the main axis of the material are often used to reveal the following information:

- a) Variations in microstructure from surface to center;
- b) Distribution of nonmetallic impurities across the section [10][11][12];
- c) Distribution of carbide net;
- d) Depth of surface imperfections;
- e) Depth of coatings;
- f) Depth of decarburization [13][14];
- g) Depth of corrosion;
- h) Surface chemical heat treatment and microstructure and thickness of coating.

4.2.3 Longitudinal sections (Surface D, E, G and H) taken parallel to the main axis of the material are often used for revealing the following information: