INTERNATIONAL STANDARD

ISO 4491-1

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Metallic powders — Determination of oxygen content by reduction methods —

Part 1: General guidelines

Poudres métalliques — Dosage de l'oxygène par les méthodes de réduction —
Partie 1: Directives générales

Reference number
ISO 4491-1 : 1989 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4491-1 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy.*

ISO 4491 consists of the following parts, under the general title *Metallic powders — Determination of oxygen content by reduction methods*:

— *Part 1: General guidelines*

— *Part 2: Loss of mass on hydrogen reduction (hydrogen loss)*

— *Part 3: Hydrogen-reducible oxygen*

— *Part 4: Total oxygen by reduction-extraction*

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Introduction

In powder metallurgy, the purity of the powders is an important parameter for the manufacture of sintered metals. Among the various impurities which may be present in a powder, oxygen plays a particular role as it is always present in any metal or alloy powder, and in amounts greater than those encountered in compact metals. Oxygen is mostly combined in the form of oxides which appear in the following ways:

— Oxide film coatings on particle surfaces, spontaneously formed by oxidation of the metal by air or moisture during powder preparation and during handling and storage.

— Oxide inclusions, being either oxides of the main metal remaining locally unreduced during the production process (in the case of reduced powders), or other oxide impurities originating from the raw material and/or from the equipment (e.g. refractory ceramics from melting furnace in atomization processes).

In practice, oxygen contents in metallic powders lie mostly in the range 0,1 % (m/m) to 1 % (m/m).

The determination of oxygen content can be made by means of many physical or chemical methods, for example

a) specific methods, such as activation analysis or mass spectrometry, in which the element O is directly determined;

b) reduction methods, in which oxides present are, totally or partially, reduced by hydrogen or by carbon. Oxygen content is related, either to the loss of mass of the sample through reduction, or to the amount of water or CO/CO_2 produced by the reaction;

c) separation methods, in which

— either the oxide phase is selectively dissolved and determined chemically (for example in copper powder, where copper oxide is dissolved by hydrochloric acid);

— or the metal phase is selectively dissolved, and the insoluble residue (assumed to be oxide) is evaluated (for example in aluminium powder, aluminium is dissolved in bromine-methanol reagent, leaving aluminium oxide).

The present International Standard considers only reduction methods, as these are commonly used in laboratories for analysing a great variety of metal powders.