PD ISO/TR 945-3:2016

BSI Standards Publication

Microstructure of cast irons

Part 3: Matrix structures

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee ISE/111, Steel Castings and Forgings.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2016

ISBN 978 0 580 90577 3
ICS 77.080.10

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 May 2016.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TR 945-3:2016

TECHNICAL REPORT

ISO/TR 945-3

First edition
2016-05-01

Microstructure of cast irons —

Part 3: Matrix structures

Microstructure des fontes —

Partie 3: Structures de matrice

Reference number
ISO/TR 945-3:2016(E)

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 25, *Cast irons and pig irons.*

ISO 945 consists of the following parts, under the general title *Microstructure of cast irons*:

— *Part 1: Graphite classification by visual analysis*

— *Part 2: Graphite classification by image analysis* [Technical Report]

— *Part 3: Matrix structures* [Technical Report]

The following parts are under preparation:

— *Part 4: Determination of nodularity in spheroidal graphite cast irons*

Introduction

The designation of cast iron matrix structures as given in this part of ISO 945 is in conformity with the designations published by several national foundry organisations[1][2][3] or other publishers[4].

This Technical Report aims to

— give the designations, precise descriptions and reference micrographs of the matrix structures of cast irons, and

— facilitate the discussion and to avoid misunderstanding between manufacturer and purchaser regarding the identification of matrix structures.

TECHNICAL REPORT ISO/TR 945-3:2016(E)

Microstructure of cast irons —

Part 3:
Matrix structures

1 Scope

This Technical Report gives the designations, descriptions and reference micrographs of the matrix structures of cast irons.

It applies to the following types of cast irons:

— grey cast irons (Table 4.1);

— spheroidal graphite cast irons (Table 4.2);

— austenitic cast irons (Table 4.3);

— malleable cast irons (Table 4.4);

— compacted (vermicular) graphite cast irons (Table 4.5);

— ausferritic spheroidal graphite cast irons (Table 4.6);

— abrasion-resistant cast irons (Table 4.7).

Each matrix structure is defined with explanations and micrographs.

Unless otherwise stated in Clause 4, the micrographs shown correspond to samples etched with a solution of 2 % nitric acid in ethanol (Nital).

2 Designations and descriptions of cast iron microstructures

2.1 Ferrite

Ferrite also known as α-ferrite (α-Fe) or alpha iron is a materials science term for iron, or for a solid solution with iron as the main constituent, with a body-centred cubic crystal structure. It is this crystalline structure which gives to steels and cast irons their magnetic properties, and is the classic example of a ferromagnetic material.

Since pearlite has ferrite as a component, any iron-carbon alloy will contain some amount of ferrite if it is allowed to reach equilibrium at room temperature. The exact amount of ferrite will depend on the cooling processes the iron-carbon alloy undergoes when it cools from liquid state.

2.2 Pearlite

Pearlite is a two-phased, lamellar (or layered) structure composed of alternating layers of alpha-ferrite (according thermal dynamical condition 88 % by mass) and cementite (12 % by mass). The lamellar appearance is misleading since the individual lamellae within a colony are connected in three dimensions; a single colony is therefore an interpenetrating bicrystal of ferrite and cementite. Pearlite is a common microstructure occurring in many grades of cast irons.

If cast iron is cooled very slowly or as a result of heat treatment, the cementite can occur in globules instead of in layers. This structure is designated as globular pearlite.