



BSI Standards Publication

Workplace atmospheres — Guidelines for selecting analytical methods for sampling and analysing isocyanates in air

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

National foreword

This Published Document is the UK implementation of ISO/TR 17737:2012. It supersedes PD ISO/TR 17737:2007 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee EH/2, Air quality, to Subcommittee EH/2/2, Work place atmospheres.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2013

Published by BSI Standards Limited 2013

ISBN 978 0 580 74192 0

ICS 13.040.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 January 2013.

Amendments issued since publication

Amd. No.	Date	Text affected
----------	------	---------------

TECHNICAL
REPORT

ISO/TR
17737

Second edition
2012-09-15

**Workplace atmospheres —
Guidelines for selecting analytical
methods for sampling and analysing
isocyanates in air**

*Atmosphères des lieux de travail — Lignes directrices pour la
sélection des méthodes analytiques d'échantillonnage et d'analyse des
isocyanates dans l'air*



Reference number
ISO/TR 17737:2012(E)

© ISO 2012



COPYRIGHT PROTECTED DOCUMENT

© ISO 2012

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

	Page
Foreword.....	iv
1 Scope.....	1
2 Isocyanates.....	1
3 Where are isocyanates found in industry?.....	1
4 Airborne isocyanates.....	2
5 Alternatives for sampling.....	3
5.1 General.....	3
5.2 Impregnated filters.....	3
5.3 Impinger (and filter).....	4
5.4 Sorbent tubes.....	4
5.5 Denuder filter.....	4
5.6 Diffusive sampling.....	4
6 Direct reading instruments.....	4
7 Short description of five proposed and/or adopted methods for airborne isocyanates.....	5
7.1 DBA method.....	5
7.2 Double-filter method.....	5
7.3 MAP method.....	6
7.4 MP method.....	6
7.5 PP method.....	6
8 Analysis.....	8
9 Interferences.....	8
10 Other sampling and analytical considerations.....	8
11 Other considerations.....	8
Bibliography.....	10

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed, unless the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 17737 was prepared by Technical Committee ISO/TC 145, *Air quality*, Subcommittee SC 2, *Workplace atmospheres*.

This second edition cancels and replaces the first edition (ISO/TR 17737:2007), which has been technically revised.

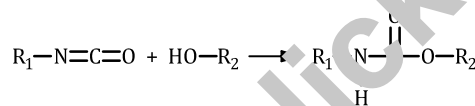
Workplace atmospheres — Guidelines for selecting analytical methods for sampling and analysing isocyanates in air

1 Scope

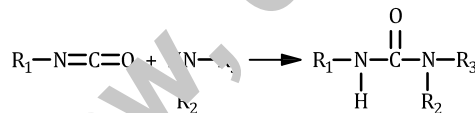
This Technical Report provides industrial hygienists, employers and workers with a broad overview of isocyanates, their uses in industry, methods of measurement and guidance on choosing the appropriate sampling strategy. While not all issues can be addressed here in detail, this Technical Report discusses areas of concern to alert the industrial hygienist, employer and worker involved with the use of isocyanates to the importance of sampling and the key issues involved in choosing a sampling strategy for their workplace, and directs them to seek further information on the topic(s) of concern.

2 Isocyanates

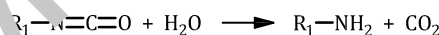
Isocyanates are compounds which contain one or more $-N=C=O$ functional groups attached to an aromatic or an aliphatic molecule. Compounds containing nucleophilic groups with active hydrogen react readily with isocyanates, as in the reaction with primary and secondary amines to form urea compounds and the reaction with alcohols and phenols to form urethane compounds.



a) Reaction with an alcohol to form a urethane



b) Reaction with an amine to form a urea



c) Reaction with water to form the corresponding amine

Figure 1 — Reactions of isocyanates

Exposures to isocyanates may result in respiratory disorders and dermal sensitization and are one of the main causes of occupational asthma. As a result, isocyanates are among the compounds with the lowest occupational exposure limits (OELs), the maximum exposure level recommended to avoid unreasonable risk of disease or injury. Their presence in different exposure situations must be monitored.

3 Where are isocyanates found in industry?

Isocyanates with a functionality (number of $-N=C=O$ groups) of two or more are used in the production of polyurethanes (PUR). The most common isocyanates used in the production of flexible and rigid PUR foams are the aromatic methylenediphenyl diisocyanate (MDI) and toluene diisocyanate (TDI). The two major aliphatic isocyanates, which are used predominantly in coatings and elastomers, are hexamethylene diisocyanate (HDI) and isophorone diisocyanate (IPDI).

Within industry, technical grade isocyanate products are mainly used. In most cases, these products consist of different monomeric isomers and oligoisocyanates that have different functionalities, and are often referred to as polyisocyanates of the diisocyanate monomer. The most frequently used TDI