



ISO 17734-1

Workplace air — Determination of organonitrogen compounds in air using liquid chromatography and mass spectrometry —

Part 1:
Isocyanates using dibutylamine derivatives

**Third edition
2026-05**

This is a preview of ISO 17734-1:2026. [Click here to purchase the full version from the ANSI store.](#)



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This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 2, *Workplace atmospheres*.

This third edition cancels and replaces the second edition (ISO 17734-1:2013), which has been technically revised.

The main changes are as follows:

- this document has been extensively revised to bring it into line with the current ISO/IEC Directives, Part 2, including updates to structure, terminology, and drafting style;
- the references have been reviewed and updated, and obsolete references have been removed or replaced where appropriate;
- the Scope has been revised to comply with current ISO requirements and to improve clarity on the applicability of the method;
- an error regarding the presentation of the analytical performance of the method has been corrected.

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Isocyanates are organic compounds containing the isocyanate functional group ($-N=C=O$) and have been used in industry for about 50 years. They are commercially important chemicals mainly used for the production of polyurethane (PUR). In spite of controls to limit exposures, there are adverse health effects such as asthma, contact dermatitis and hypersensitivity pneumonitis as consequences of exposure to isocyanates in some industrial sectors.

The analytical method for the determination of isocyanates in workplace air must be sensitive due to the high irritation and sensitization properties of isocyanates. Extremely low occupational exposure limits (OELs) exist in many countries, and concentrations well below the OEL, often less than one hundredth of the limit, are often to be determined. Isocyanates are very reactive and therefore cannot be analysed directly. Derivatization during sampling is required in order to prevent interfering reactions. Hundreds of different isocyanates are used in industry, and many more are formed during thermal degradation of PUR. Therefore, high selectivity of the analytical method is required for accurate results.

The determination of isocyanates in the work environment using di-*n*-butylamine (DBA) as a reagent and liquid chromatography-mass spectrometric detection (LC-MS) has been demonstrated to be a robust method. The development of the method was initiated when difficulties using the “older” methods during sampling of isocyanates in complex atmospheres were encountered (e.g. thermal decomposition of PUR).^{[1][2][3]} The reaction rate between DBA and isocyanates was found to be fast, and high concentrations can be used to secure instantaneous reactions and eliminate problems with interfering compounds.^{[4][5]} Using impinger flasks containing a reagent solution and a filter in series efficiently collects and derivatizes isocyanates in both the gas and the particle phase.^[6] LC-MS/MS of the isocyanate-DBA derivatives enables highly selective and precise determinations down to levels below 10^{-6} of the OEL^[7].

Solvent-free sampling can also be performed by using a tube coated with a DBA-impregnated glass fibre filter followed by an impregnated filter. An impregnation solution containing DBA together with an acid is used, and the formed ion pair reduces volatility. DBA remains on the filter even after 8 h of sampling^[8].

Monomeric isocyanates that are formed during thermal decomposition of polymers [typically PUR and phenol-formaldehyde urea (PFU) resins], such as isocyanic acid and methyl isocyanate, can also be determined.^{[6][7][8][9][10]} Volatile isocyanate-DBA derivatives can be determined using gas chromatography-mass spectrometric detection (GC-MS).^[9] Using the DBA method and derivatization with ethyl chloroformate makes simultaneous determinations of amine, aminoisocyanates and isocyanates possible, as described in the companion method in ISO 17734-2^[11].

For quantification, reference compounds are necessary but are only available for a few monomeric isocyanates. Most of the isocyanates that are used in industry for the production of PUR can only be obtained in technical grade mixtures. Many isocyanates that are formed during thermal degradation are not available and are not easily synthesized. In this method, a nitrogen-sensitive detector has been used for quantifying isocyanates in reference solutions. This technique has been demonstrated to be a useful tool, together with MS characterization, in greatly facilitating the production of reference solutions^{[10][12][13]}.

For quantifying isocyanates in complex mixtures, MS detection appears to be the current best available detection technique and provides a unique possibility of identifying unknown compounds. This method has enabled assessment of new areas for which exposure to isocyanates was not known previously and has identified new kinds of isocyanates in the work environment^{[6][7][8][9][10][12][13]}.