

TERMS OF REFERENCE FOR THE R&D PROJECTS

[Chemical Methods of Test Sectional Committee TXD 05 under Textiles Department of BIS]

1) Title of the project: — Development and validation of test method for determination of Polycyclic Aromatic Hydrocarbons (PAHs) in textiles and textile products

2) Background: -

2.1 Polycyclic Aromatic Hydrocarbons (PAHs) are a group of structurally related hydrocarbons. PAHs are naturally occurring substances in fossil fuels and may be formed during incomplete combustion of organic materials. Oils contaminated with PAHs may be used as softeners or extenders in rubber and plastic. PAHs also may be formed by thermal decomposition of recycled materials during reprocessing and may be present as impurities in carbon black pigments and dyestuff. PAHs (Naphthalene) are often present as an impurity from raw materials used as intermediates in the production of textile dye dispersing agents and may be found in textiles.

2.2 PAHs have been identified as being a great concern regarding potential exposure and adverse health effects on humans, thus legislation in major markets around the world restricts the presence of PAHs in finished products. They persist in the environment and accumulate in food chains and can have an adverse effect on aquatic life and humans, including mutagenic, toxic, and/or carcinogenic properties.

2.3 Many commercial labs are doing the testing for Polycyclic Aromatic Hydrocarbons (PAHs) as per inhouse method (Solvent Extraction/GC-MS) or using other international standards such as BS EN 17132 :2019, EN 17132 : 2019, AfPS GS 2019:01 PAK as per customer/user requirement.. There is no Indian/ISO Standard on the subject for textiles and textiles products.

2.4 Given the potential health and environmental risk, it is imperative to develop reliable and accurate methods for the determination of Polycyclic Aromatic Hydrocarbons (PAHs). This R &D project will serve as a basis for development of a uniform standard on test method for Polycyclic Aromatic Hydrocarbons (PAHs).

3) Objective

To develop and validate test method for determination of polycyclic aromatic hydrocarbons (PAHs) by Gas Chromatography Mass Spectrophotometry (GCMS) in textiles and textile products from primary and secondary sources.

4) Scope: -

- a) Undertake study and analyse the existing literature which include but not restricted to the following :-
 - i) BSEN, EN, AfPS and other International Standard
 - ii) Regulation at International level
 - iii) Restricted polycyclic aromatic hydrocarbons
 - iv) Standard operating procedures (SOPs)/guidelines of laboratories
 - v) Journals and research papers
 - vi) Any other relevant published information
- b) Collection of the database of testing infrastructure and users in the country.
- c) Undertake 2 visits to NABL accredited testing labs (one Govt and one private) having capability to do testing of polycyclic aromatic hydrocarbons to collect information including but not restricted to the following: -
 - i) Witness the testing and understand the testing procedure
 - ii) Testing methods and regulation being followed
 - iii) Restricted polycyclic aromatic hydrocarbons being tested for textiles products
 - iv) Technical data and information on scope, principle, apparatus/equipment, reagents/chemicals, test specimen preparation, testing procedure, gas chromatographic determination/instrument diagram, calibration, expression/calculation of results
 - v) Focused group discussion on testing related issues, challenges being faced and suggestion

The feedback from other labs (Govt and private NABL accredited) where visit is not carried out shall be obtained through suitable questionnaire covering above information.

- d) Provide technical data and information for development of test method in Indian Context based on literature survey, International Standards, laboratories practices, lab visits. The technical data shall include but not restricted to the following information: -
 - i) Scope
 - ii) Term and definitions
 - iii) Principle
 - iv) Apparatus/chemical reagents
 - v) Preparation of test specimen
 - vi) Testing, extraction and filtration procedure
 - vii) List of restricted chemicals
 - viii) Gas chromatographic determination/instrument diagram
 - ix) Calibration, expression/calculation of results
 - x) Test report format

Note - The technical/scientific data collected shall not violate copy right/patent right (if any) on the proposed subject.

- e) Purchase 3 samples of different known impurity and carry out interlaboratory validation of the GC-MS method from 5 NABL Accredited lab.

Note - While sending the samples for interlaboratory test, either the samples may be spiked or may be purchased from Proficiency testing (PT) service provider with known quantity/limit (ppm) of impurity of chemical substance.

- f) Validation should include studies on linearity, precision, accuracy, limit of detection (LOD), limit of quantification (LOQ), and recovery rates. Validation shall cover a range of restricted polycyclic aromatic hydrocarbons commonly found in textiles and textiles products.
- g) Preparation of a comprehensive project report covering all the above information.

5) Research Methodology: -

- a) Collect and analyse the data/information as specified in the scope [4 (a) and (b)].
- b) Visit labs and collect data/information as specified in the scope [4 (c)].
- c) Prepare technical data, test the samples and validate the test method as specified in the scope [4 (d), (e) and (f)].
- d) Analysis the data/information and prepare a comprehensive project report.

6) Expected Deliverables: -

- a) Comprehensive report in soft/hard form covering all the aspects detailed in the scope of the R & D project.
- b) Questionnaire feedback, reports of visit, testing/validation results, focussed group discussion report, other relevant documents and information shall be appended to the project report.

7) Requirement for the CVs:-

The person shall be at least graduate in Textile Technology or Textile Engineering or Textile Chemistry or Fibre science and Technology or Manmade Fibre Technology or B.Sc. in Chemistry.

8) Timeline and Method of Progress Review:-

The duration of the project is **150 days** from the date of the award of the project. The stagewise indicative timelines are as follows:-

Time line	Method of progress
0 to 45 days	Literature review, desktop study, collection of data and information Note: - The plan for visit and collection/purchase of samples shall be discussed and finalized with nodal officer after literature survey and desktop research.
46 to 90 days	

	<p>Visit to testing labs, collection of data and information</p> <p>Technical data/information on test method for determination of polycyclic aromatic hydrocarbons (PAHs)</p> <p>Note: - The test method shall be reviewed by the technical committee TXD 05 before purchase of samples and validation process.</p>
91 to 135 days	<p>Collection/purchase of samples</p> <p>Testing of samples/Interlaboratory validation of test of 3 different samples from 5 labs accredited by NABL</p> <p>Preparation and submission of draft report to BIS</p>
136 to 150 days	<p>Submission of the final project report.</p>

9) Support from BIS:-

- a) All the relevant Indian Standards/ISO Standards or any other standards required during the project will be provided by BIS.
- b) Facilitate/introduction of the project leader/organization to relevant Industry and industry association, testing lab, institute, academia, user, regulator/ministries.
- c) Facilitate testing of samples in BIS Lab/BIS Recognized Lab.

10) Nodal Point

In case of queries/clarification, Shri Dharmbeer, Scientist D and Member Secretary of TXD 05 may be contacted on txd@bis.gov.in, 011-23231282, 9910825544.