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**Prüfmethode für Textilien –
Bestimmung der Faserfreisetzung beim Waschen und des aeroben
Abbaugrads in wässrigem Medium unter Berücksichtigung der
Ökotoxizität; Text Englisch**

Test Method for Textiles –

Determination of fibre release during washing and aerobic degradation level in aqueous medium in consideration of ecotoxicity; Text in English

Méthode d'essai pour les textiles –

Détermination de l'release textile et du degré de dégradation aérobie en milieu aqueux, compte tenu de l'écotoxicité; Texte en anglais

Gesamtumfang 22 Seiten

Dieses Dokument wurde durch die im Vorwort genannten Verfasser erarbeitet und verabschiedet.

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Foreword

This DIN SPEC has been developed according to the PAS procedure. The development of a DIN SPEC according to the PAS procedure is carried out in DIN SPEC-consortiums and does not require the participation of all stakeholders.

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At present, there are no standards covering this topic in the body of German Standards.

DIN SPECs are not part of the body of German Standards.

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Introduction

Microplastics from the textile treatment process have been found in waste water and even in lakes, rivers and oceans, as well as in sediments and in the deep sea [1] [2] [3] [4] [5] [6] [7] [8]. The plastic particles are insoluble in water, difficult to degrade and can accumulate in organisms. Microplastics in the aquatic ecosystem can affect the growth, development, behaviour, reproduction, and mortality of marine and freshwater wildlife [9]. The widespread contamination is increasingly becoming a global health risk for humans as plastics enters our food chain and water supplies. Although mismanaged plastic waste is still the main source of marine plastic pollution globally, in some countries, more plastics are released from driving and washing activities than from the mismanagement of waste [10] [11] [12] [13] [14]. The International Union for Conservation of Nature (IUCN) estimated that a range between 0,8 Mt and 2,5 Mt per year of plastics [15] directly released into the environment as small particles, also known as primary microplastics, are released into the ocean. Apart from the erosion of tyres, the micro-size fibres generated from the release of textiles during laundering represents one of the most significant fraction [15]. Not all textiles behave in the same way. For example, according to a British study polyester fleece materials lose an estimated 1 900 fibres per wash cycle. A polyester shirt fabric loses only about half as many [16] [17]. Nevertheless, most of the reports in literature are not standardized and it is hard to make comparisons [18] [19]. The use and especially the washing process of textiles releases microparticles and fibres that are not completely retained by waste water treatment plants and can enter the environment. Although modern waste water treatment plants already remove microplastics very well, large amounts of waste water with low concentrations of microplastics are discharged into freshwater and oceans every day [7] [8]. Due to the longevity of non-biodegradable fibres, they pose the highest risk to the environment. However, this does not mean that biodegradable fibres, such as natural fibres, are completely harmless [20] [21] [22] [23]. This is because biodegradable fibres also remain in the environment for a certain period of time until they are completely degraded and can therefore also have a negative impact on the environment. In addition, additives or auxiliaries used in textile production as well as finishes can further slow the degradation process down and can themselves be harmful to the environment due to their presence [24].

Against this background, this DIN SPEC represents a standardised procedure for the classification of textiles based on their environmental impact during use, in particular through the washing process. Textiles are classified in terms of fibre release during the washing process with the aid of a suitable analysis system. In addition, the textile discharge is further classified by testing its biodegradability in waste water and determining the degree of degradation within a defined period of time, to simulate surroundings of waste water treatment plants. Finally, a suitable ecotoxicity test is carried out, to determine the toxicity of residues after the biodegradation process.

This new standard enables companies to test, evaluate and compare their developments into textile products for the first time, regarding the fibre release during washing and the environmental impact of this fibre release. Thus, after testing and classification, an optimisation of the product portfolio and at the same time a more targeted product development can take place, as the environmental impact can be actively and consciously controlled.

1 Scope

This document defines a standardized test method to determine and classify the environmental impact of textiles during washing, using the following parameters for classification:

- a) fibre release during washing (Clause 7);
- b) biodegradability of the textile discharge (8.1);
- c) ecotoxicology of the textile residues on water quality (8.2).

This document is designed to assess the loss of fibres during washing from all textile materials and different textile constructions.

The following materials can be tested according to this DIN SPEC:

- made of natural or synthetic fibres and mixtures of the fibres
- coated, laminated, finished and raw textile materials
- different textile constructions such as woven, knitted, felts and other piece goods

This document specifies methods to provide a means of systematically evaluating textile discharge from textile materials under defined washing conditions to achieve comparable results.

The methods of the washing process provide a means to systematically assess textile discharge from textile materials during washing.

The method for biodegradability applies to textile discharge. The biodegradability defines the degradation level within a defined period of time without the necessity of ultimate aerobic biodegradation.

The ecotoxicological assessment constitutes a screening and does not include the full consideration of the ecotoxicological impact.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DIN EN ISO 14851:2019-07, *Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by measuring the oxygen demand in a closed respirometer (ISO 14851:2019); German version EN ISO 14851:2019*

DIN EN ISO 20079:2006-12, *Water quality — Determination of the toxic effect of water constituents and waste water on duckweed (Lemna minor) — Duckweed growth inhibition test (ISO 20079:2005); German version EN ISO 20079:2006*

ISO 4915, *Textiles — Stitch types — Classification and terminology*

ISO 4916, *Textiles — Seam types — Classification and terminology*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

DIN and DKE maintain terminological databases for use in standardization at the following addresses:

— DIN-TERMinologieportal: available at <https://www.din.de/go/din-term>

— DKE-IEV: available at <http://www.dke.de/DKE-IEV>

3.1

aerobic biodegradation

decomposition of an organic compound to carbon dioxide, water, mineral salts and new biomass by microorganisms in the presence of oxygen

3.2

Dynamic Image Analysis

DIA

method to determine the quantity, size and shape of fibre release

3.3

ecotoxicological screening

method to evaluate the toxic effects of substances

EXAMPLE textile residues after biodegradation.

3.4

fibre release

fibres released from textile products during washing without particles/substances stemming from the textile material

3.5

process waste water

all washing liquid with textile discharge from the lab scale washing process, without detergent

3.6

simulated textile discharge

fibres generated with a cryogenic mill, within the size range of real fibre release after washing, including particles/substances stemming from the textile material

3.7

sludge

biomass, which develops during waste water purification in waste water treatment plants under aerobic conditions, due to the growth of bacteria and other microorganisms in presence of solute oxygen

3.8

textile discharge

materials released from textile products, due to mechanical abrasion while washing, composed of fibres and other particles/substances

3.9

textile residues

residues from textile discharge after biodegradation process

4 Equipment

4.1 General

In the following, the equipment and the workplace that shall be used is described.

4.2 Equipment for textile preparation and lab scale washing process

— lint roller;