

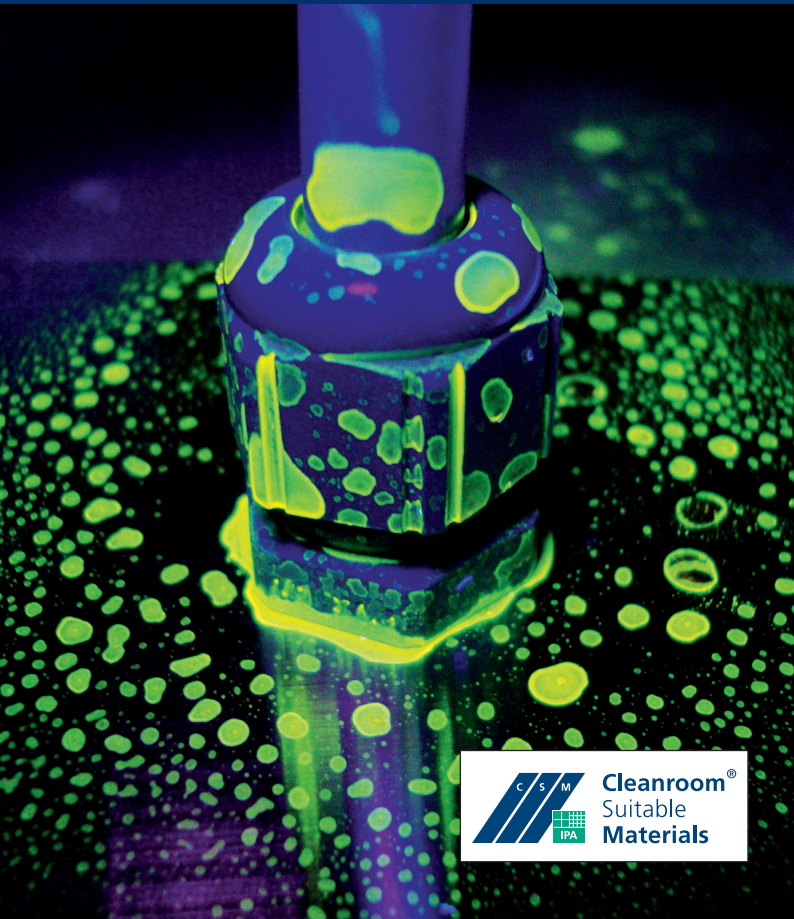


**Fraunhofer**

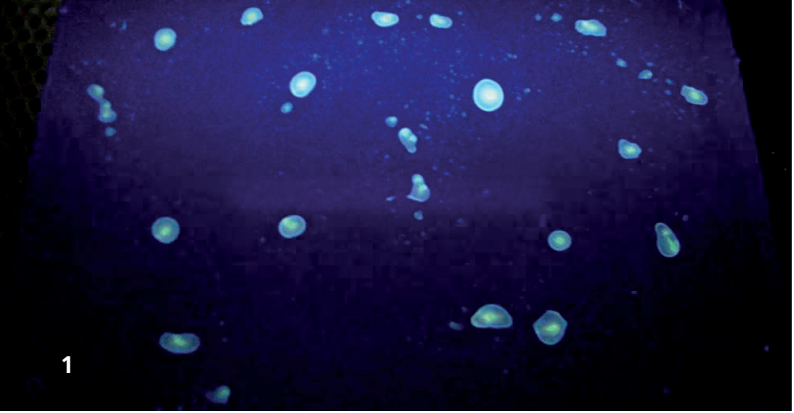
IPA

FRAUNHOFER INSTITUTE FOR  
MANUFACTURING ENGINEERING AND AUTOMATION IPA

# CLEANABILITY OF SURFACES – CSM RIBOFLAVIN TEST



**Cleanroom<sup>®</sup>**  
Suitable  
Materials



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## Problem

In accordance with different hygienic manufacturing guidelines for food productions and pharmaceutical industries, all relevant surfaces have to be especially easy to clean and disinfect. Polished stainless steel surfaces are generally considered to be ideal in cases where materials are in close contact with products. But what about the cleanability of flooring systems, wall coatings, sealants, painted surfaces, and other relevant surfaces in a hygienic manufacturing environment? And what about the cleanability of possible surface defects caused by mechanical impact or application processes? In order to know the overall cleanability of the complete manufacturing environment, the cleanability of all these materials and surfaces needs to be assessed. Fraunhofer IPA uses a modified VDMA riboflavin test procedure to evaluate the cleanability of material surfaces directly and reliably, and assesses the suitability of the tested surfaces for use in hygienic environments

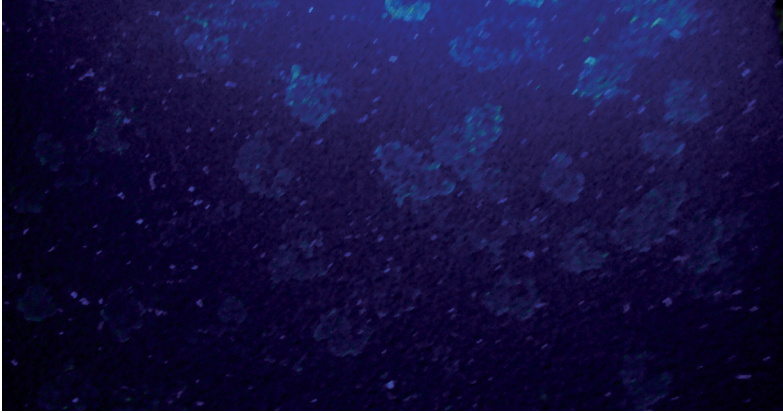
- 1 *Surface 1: before (left) and after (right) cleaning, illuminated with UV light.*
- 2 *Surface 2: before (left) and after (right) cleaning, illuminated with UV light.*

## Test procedure

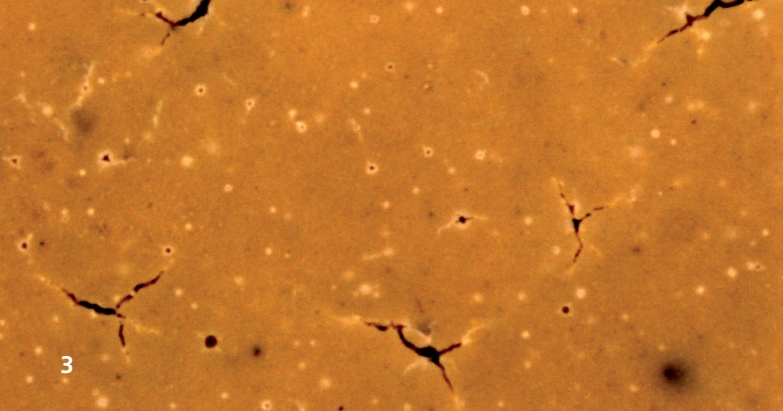
To assess the cleanability of test surfaces, a contaminant mixture containing riboflavin is applied to the respective surfaces. The contamination is fluorescent yellow in color and clearly visible. The contamination is subsequently removed using a reproducible cleaning process. For flat surfaces, a cleaning simulator is implemented in order to obtain comparable results. After cleaning, the success of the cleaning procedure is evaluated based on the presence of any residual contamination. The use of a fluorescent pigment enables areas which are difficult to clean (edges, angles, depressions, etc.) to be clearly visualized. The ability to clean a test surface effectively is ascertained by visually assessing the amount of fluorescent residue present in compliance with ISO 4628-1 and -2.

According to VDI 2083-17, cleaning efficacy can be classified as follows:

<b>Rating of cleaning efficacy</b> (according to ISO 4628-1)	<b>Visual assessment</b> (according to ISO 4628-1)
0	No residues visible at all
1	Very few, small, barely significant residues or number of residue spots
2	Few, small, but significant residues or number of residue spots
3	Moderate residues or number of residue spots
4	Considerable residues or number of residue spots
5	Dense pattern of residues or residue spots



<b>Sample images</b> (according to ISO 4628-2)	<b>CSM classification</b> (according to VDI 2083-17)
	Excellent
	Very good
	Good
	Weak
	Very weak
	None



## Example

### *Image 1: Surface 1 – excellent cleanability*

Surface 1 showed no fluorescence residue after cleaning. The cleaning procedure was sufficient to remove all detectable contamination. The cleaning efficacy, and thus the cleanability of the surface with the cleaning method used, is excellent.

### *Image 2: Surface 2 – not cleanable at all*

Surface 2 showed nearly the same amount of fluorescence residue before and after cleaning. The cleaning procedure was not highly ineffective. The surface is not cleanable with the cleaning method used. The cleaning efficacy is extremely poor.

**TITLE** *Standard cable gland with fluorescence contamination.*

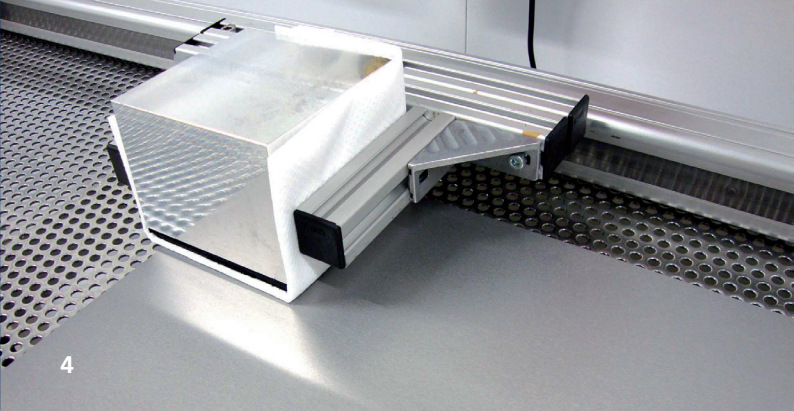
**3** *Crack in the coating surface.*

**4** *Cleaning simulator with brushed stainless steel as reference surface.*

## **Our range of services**

- Assessing the cleanability of surfaces: filmy and particulate contamination
- Helping you to select materials for use in the various hygienic manufacturing environments
- Assessing hygienic design features
- Workshops on hygienic design
- Microbiological monitoring
- Microscopic surface examination





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For further information about our range of services, solutions and consultancy, please contact our experts.

**Department**

Ultraclean Technology and Micromanufacturing

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