



TECHNICAL PAPER

Discoloring of elastic floor coverings due to aromatic binders

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Brief overview

Colored rubber granules are usually processed with a one or two component polyurethane binder to install an elastic floor covering. However, certain polyurethane binders tend to yellow and, under certain circumstances, can temporarily influence the appearance of an elastic floor covering. This can be prevented by choosing the right binder. This technical paper explains the background to this phenomenon and provides appropriate solutions.

Introduction

Colored rubber granules are processed with a one or two component polyurethane binder or coating to install an elastic floor covering. Polyurethane binders from various manufacturers are available for processing, which can be differentiated into aromatic and aliphatic binders based on the isocyanates used. An aromatic binder is usually used as the standard binder for installing an elastic floor covering made of colored rubber granules. Under certain circumstances, however, the use of aliphatic binders can be useful.

«Yellowing effect» with aromatic binders

Aromatic binders are usually amber-colored and not lightfast. When exposed to UV radiation, they tend to form a yellowish film. This means they tend to become yellow when exposed to sunlight. This phenomenon is called the “yellowing effect”. Such yellowing of the binder usually occurs within hours after the floor covering has been installed. When processing colored rubber granules, this effect can lead to undesirable color changes on the surface and can affect the appearance of the installed floor covering. A floor covering made of light blue rubber granules, for example, appears greenish when using aromatic binders, a floor covering made of light gray rubber granules, on the other hand, appears more yellowish to brownish. In the case of a floor covering made of yellow rubber granules, however, yellowing will hardly be noticeable. Thus, the extent to which yellowing becomes visible is depending on the color of the rubber granules and the intensity of the UV radiation. Depending on the amount of UV radiation, it is also possible that areas of a floor covering that are exposed to greater UV radiation differ in color from other areas with less UV radiation. In the case of installations that cannot be completed in one day, the color can also vary along the day's seam.

The color change described is not a change in the color of the rubber granules, but only a very thin and discolored binder film. The original color of the rubber granules is retained under this binder film, so that there is only a change in the visual perception of the original color. The binder film will be removed by regular use and weathering. This means that the change in color recedes due to abrasion and weather influences after a certain time. This usually happens within two to six months. In areas with a lower intensity in usage, however, this can also take significantly longer. As a result, the change in visual perception is not permanent, but rather weakens almost completely over time and sooner or later the floor covering regains its original color.

Most important is to point out that such a color change, which was caused by the yellowing of an aromatic binder, has solely an optical character and has absolutely no influence on the properties of the material. The technical and mechanical properties of the granules themselves, as well as of the floor covering, are

completely retained and the durability of the floor covering is not affected. A yellowing or color change caused by using aromatic binders does not indicate inferior material or an incorrect installation in any way.

Examples to illustrate the «Yellowing effect»

1) Case study – Play area with a floor covering made of light blue rubber granules



Image 1:
A floor covering made of light blue rubber granules installed with an aromatic binder directly after installation.



Image 2:
Just 24 hours after installation, the same floor covering no longer appears light blue but green due to the yellowing of the aromatic binder.

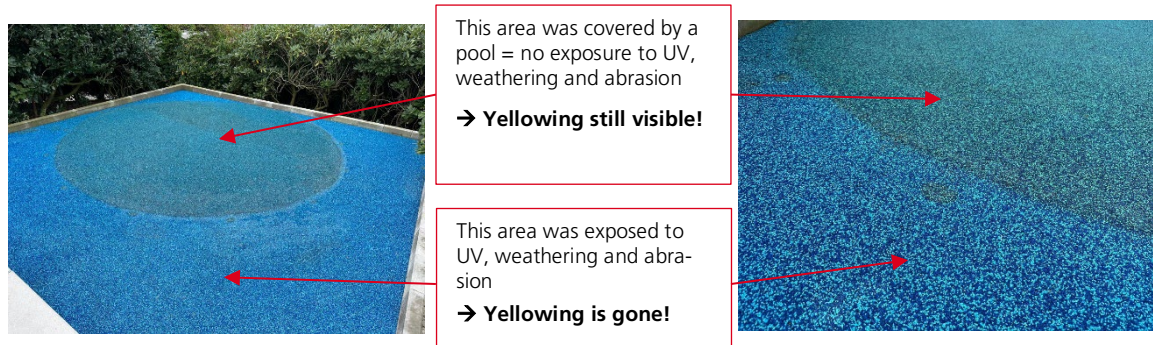
2) Rubber granules (color: eggshell) with aromatic and aliphatic binders in a visual comparison



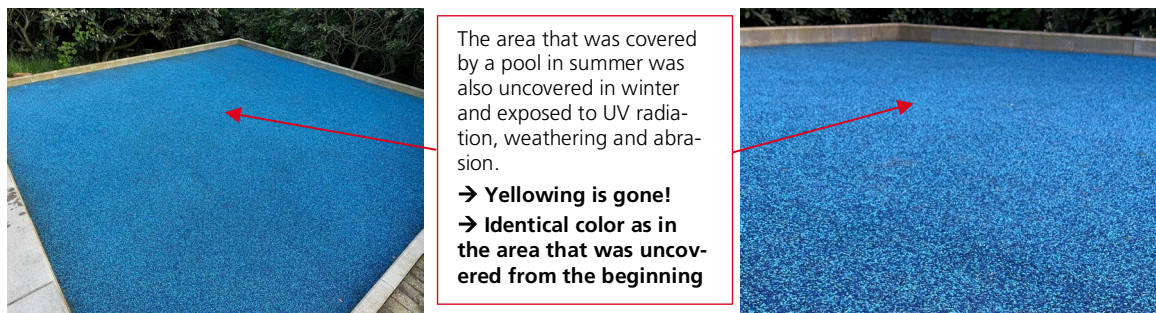
Image 3:
Both colors are eggshell; However, the smaller area was made with aromatic (= non-lightfast) binder.

3) Case study – Pool area in a private garden (Ibbenbüren, Germany)

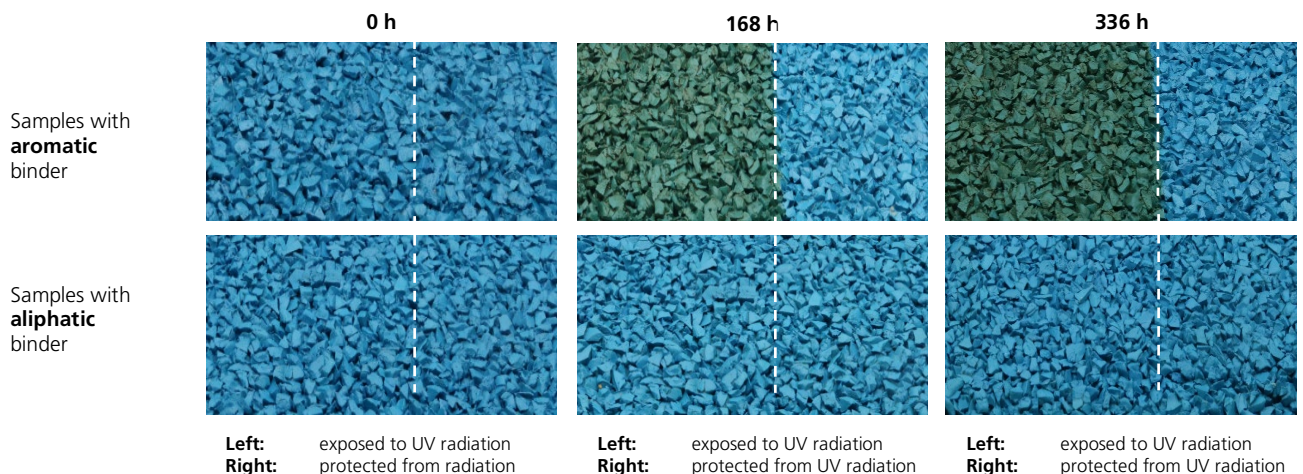
The flooring was installed on May 18, 2023 with an aromatic, non-UV-stable binder and got yellowish within days. A pool was then installed on the yellowed surface and remained there over the summer. The pictures were taken on September 30, 2023 (= 135 days after installation), after the pool was dismantled for the winter.



Over the winter, the entire area was uncovered and exposed to the conditions of a northwestern European winter. The pictures show the area after the first winter and were taken on May 1, 2024.



4) Tests with simulated UV radiation (UVA aging according to EN 14836)





Choosing the right binder

Although the technical and mechanical properties are not influenced, a temporary color change caused in this way can be undesirable for the visual impression and can lead to irritation or complaints. By choosing the right binder, however, it is possible to avoid temporary yellowing of the elastic floor covering. The alternative to aromatic binders are so-called aliphatic, UV-stable binders. There is no difference between aromatic and aliphatic binders in terms of application. Aliphatic binders are usually colorless and free from aromatics, so that they cannot yellow due to UV radiation. Aliphatic binders are therefore called lightfast or UV-stable binders. The disadvantage of aliphatic binders, however, is their significantly higher price compared to aromatic binders.

The right binder is not only determined by the color of the rubber granules but also by other locally given parameters. A general recommendation for the right binder is therefore not possible. Nevertheless, indicators can be determined on which a recommendation can be made. These indicators are first of all the selected color of the rubber granules, but also the UV exposure that can be expected at the planned installation location. Although every color is affected to a certain degree by the yellowing when using aromatic binders, yellowing is often particularly noticeable with the following colors: light blue tones, light green tones, light gray and white tones, as well as strong colors such as purple and pink.

Further information on choosing the right binder for the different colors of our GEZOFLEX granules can be found in the supplementary document «Binder recommendation GEZOFLEX EPDM granules», which is available on request.



Lessons learned

- ✔ Aromatic binders are not lightfast and tend to yellow due to UV radiation (so-called “yellowing” effect).
- ✔ The yellowing of the aromatic binder film can, under certain circumstances, result in a different color impression of the surface. Regular use and weathering will remove the binder film so that the discoloration will disappear.
- ✔ The discoloration does not affect the technical and mechanical properties of the granules or the floor covering and has no negative impact on the durability of a floor covering.
- ✔ Aliphatic binders are lightfast and do not show any yellowing but are correspondingly more expensive.
- ✔ The choice of a suitable binder depends on the one hand on the color of the rubber granules used and on the other hand on local parameters.

Index of relevant terms

Aliphatic binder	Colorless and lightfast polyurethane binder for the installation of floor coverings made of EPDM and other rubber granules
Aromatic binder	Amber-colored and non-lightfast polyurethane binder for the installation of floor coverings made of EPDM and other rubber granules
EPDM granules	Rubber granules made of synthetic rubber, which is used in various grain sizes and various colors for the installation of sports and leisure floor coverings
Yellowing effect	Yellowing of the aromatic binder due to UV radiation

Disclaimer

All information given in this technical paper is made to the best of our knowledge and belief and is based on experiences. Therefore the information provided is not binding. This technical paper is only intended to support the user in his decision whether products are suitable for his intended purpose or not and to explain technical issues that may be relevant to this decision-making process. It remains the duty of the user to check the suitability of the product for its intended use and to ensure that the goods are suitable in terms of shape and quality for the intended purpose.