



Theme: **Safety of silica gels with color indicators**

Question: *Is silica gel with color indicator toxic and need labeling as hazardous?*

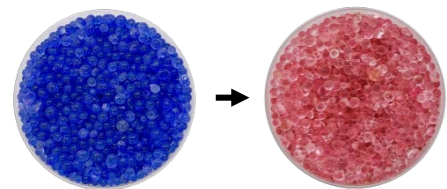
Answer:

It depends on the color indicator. According to European Union legislation pure silica gel, molecular sieve and alumina are not classified as hazardous. Furthermore, they are non-flammable and chemically stable. In case of appropriate handling and use no ecological problems are to be expected.

If these adsorbents used in breather dryers, they are often coated with a color indicator. Especially silica gel is available with various color indicators that indicate the water content above a certain weight. Some color indicators are classified as toxic and hazardous to health. Because of these color indicators some silica gels have to classify as hazardous.

Blue silica gel with color indicator cobalt(II)chloride

As color indicator very often cobalt(II)chloride (CoCl_2) was used in the past. If the silica gel has bound water, this indicator changes color from blue to pink. During this process the Hexaaqua complex is formed ($[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_2$). Upon drying, this process is reversible.



Until today, breather dryers are used with "blue silica gel". And this despite of the fact that cobalt(II)chloride is considered to be carcinogenic and teratogenic and potentially mutagenic.¹ This substance was on 28 October 2008 again by ECHA (European Chemicals Agency) included in the candidate list of substances of very high concern "Substance of Very High Concern (SVHC)". The entry was on 20 June 2011 added to the reproductive toxicity properties.²

¹ Source: Wikipedia: www.wikipedia.de. Begriff Cobalt(II)-chlorid.

² Source: ECHA - Candidate List of Substances of Very High Concern for Authorisation: www.echa.europa.eu.



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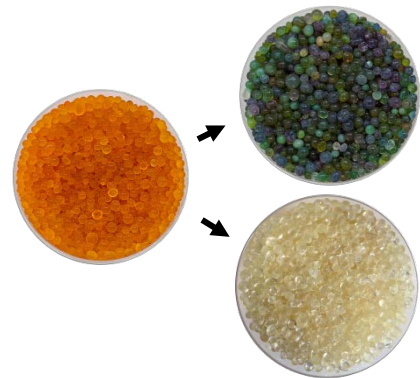
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By this fact, for example the EEA (Electricity Engineers' Association of New Zealand) recommended in a handling recommendation of April 2013 to its members to use silica gel orange to minimize the risks.³



Silica gel orange with organic indicator

For several years, silica gel is produced and used with heavy metal-free indicators. As indicators often pH indicators can be used, which belong to the organic dyes. These have the character of weak acids or bases. The acid has a different color than the corresponding base. For silica gel, this means that with increasing water content, the pH content and the color changed e.g. from orange to green or white. This process is reversible and can be performed repeatedly.



By the use of silica gel orange is to be observed which indicator and the amount of them are used. For example silica gel orange is available with 2.5% methyl violet.⁴ This proportion of methyl violet is worrying and also classified as toxic.

Manufacturer of silica gels, place the value to sustainability and health conscious and eco-friendly products, without such compositions. Since the color indicator has a significant impact on the quality of a silica gel, the exact mixing ratio is not specified by the manufacturers with a claim to quality.⁵

It is important that the manufacturers in their safety data sheets according to Regulation (EC) No 1907/2006 must make key information for use and compatibility.

³ Source: EEA - Management of Blue Indicating Silica Gel in the Electricity Supply Industry: www.eea.co.nz.

⁴ Source: Safety data sheet CALDIC Germany - Caldicgel Oranje B.

⁵ Source: Phone calls and emails with numerous manufacturers and dealers. Among other, BASF, Merck, Steiner chemistry, Sigma-Aldrich and own suppliers.



| | Silica gel Blue ⁶ „Blue gel“ | Silica gel Orange ⁷ „Caldicgel Oranje B“ | Silica gel Orange „offered version“ |
|---|--|--|---|
| Subject to labeling hazardous substances under REACH | Cobalt(II)chloride | Methyl violet | None |
| Hazards | May cause cancer by inhalation. Toxic hazard designation | Harmful to aquatic organisms, may cause long-term adverse effects. | Not classified as dangerous. |
| Handling | Use only in well-ventilated areas. Do not breathe vapors and dust. | Keep container tightly closed. Open container with care and handle. | Avoid formation of dust and aerosols. |
| Toxicological information | Known carcinogen product. | The usual precautionary measures for handling chemicals should be followed. | The usual precautionary measures for handling chemicals should be followed. |
| Ecotoxicity | May cause long-term adverse effects. Do not flush into surface water or sanitary sewer system. | Toxic to aquatic organisms. May cause long-term adverse effect. The substance is harmful to the environment. | Known or suspected No negative effects. |
| Legislation | R22 - Harmful if swallowed. R42/43 - Prevent sensitization by inhalation and skin contact. R49 - May cause cancer by inhalation. R50/53 - Very toxic to aquatic organisms, may cause long-term adverse effects. | R22 - Harmful if swallowed. R40 - Evidence of a carcinogenic effect. R41 - Risk of serious damage to eyes. R50/53 - Very toxic to aquatic organisms, may cause long-term adverse effects. | None |

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⁶ Source: Safety data sheet Merck - Blaugel.

⁷ Source: Safety data sheet CALDIC Germany - Caldicgel Oranje B.