Safety Assessment

GASODOR® S-FREE

A product of

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Assessment prepared by

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Objective

Gasodor® S-Free is an odorant mixture which is added to natural gas at a maximum concentration of 7 ppm to give a warning smell to the gas. The main ingredients are ethylacrylate (CAS-Nr. 140-88-5) and methylacrylate (CAS-Nr. 96-33-3) which are contained in the product in concentrations of > 50% and 25-49%, respectively. Both substances are listed in Annex I of EU Directive 67/548/EEC and are labeled with R43 (may cause sensitization by skin contact) because of their known sensitizing potential.

According to the conception of the German Allergy and Asthma League („Deutscher Allergie- und Asthmabund e.V.“) the odorant mixture contained in the gas, that potentially ends up in indoor air before burning of the gas, could cause allergic reactions of the respiratory system. In contrast, the products of combustion (CO, CO₂, H₂O) are harmless.

Allergic reactions, allergenic substances

Contact allergies become manifest mostly in form of a contact dermatitis which is based on an immune reaction of the delayed type (IV). Mostly low molecular weight substances are the cause, which become antigens when binding to peptides or proteins. Information on the contact allergenic potential of a substance can be obtained by investigations with exposed persons and in animal tests.

Substances causing respiratory allergies mostly are macromolecular substances, specifically peptides or proteins. The allergic reaction is provoked by an immune reaction of the immediate type (I). There are also a few known low molecular weight substances causing specific immunologic reactions of the respiratory system. As a rule these few low molecular weight substances causing respiratory sensitization are also strong contact allergens.

In official data banks (MAK-List, „Chemikalien und Kontaktallergie“ of DIMDI, ESIS, IUCLID, HSDB) indications for a contact allergenic effect of the two acrylates can be found. However, indications for an allergenic potential to the respiratory system were not found.

The data summarized in the following chapter indicate a relatively weak sensitization potential of the two acrylates which only was observed in contact with skin and at concentrations relevant to the workplace.
Contact allergenic potential

Ethylacrylate

There are individual cases with positive Patch-Test reactions at a concentration of 1% ethylacrylate in petrolatum [1-5]. At a concentration of 0.1% in petrolatum there were no positive reactions in 37 painters and burnishers with occupational dermatosis [6]. In a maximization test in human volunteers with an induction and challenge concentration of 4% 10 out of 24 volunteers reacted positively [citation in 7]. In the „Finnish Institute of Occupational Health“, Helsinki, during ten years in 16 out of 192 persons who were tested in the epicutaneous test allergic reactions to ethylacrylate were noticed; the concentration ranged between 0.1% and 0.5% [citation in 8].

In animal tests with Guinea pigs positive results only were obtained under conditions removed from reality (repeated intradermal application with Freund adjuvant for increasing the reaction) [9]. Without adjuvant no indication of a sensitizing potential was observed. There were no cross-reactions with methylacrylate.

Methylacrylate

There is only one report with two individuals reacting positively in a Patch-Test with 22 human volunteers. The concentration amounted to 2% methylacrylate in olive oil. At a concentration of 20% 1/3 of the volunteers showed a skin irritation. In a repeat test 9% of these volunteers reacted positively [10].

In animal tests Guinea pigs reacted positively in different experimental set-ups when an adjuvant was used [11]. Inconsistent results were observed in epicutaneous tests (without adjuvant). In the Local Lymph Node Assay in mice methylacrylate was rated as moderately sensitizing [12].

Assessment

For both ethylacrylate and methylacrylate in man and in animal tests reasonable indications of a moderate contact allergenic activity were found. However, the survey of the current literature does not give indications of a sensitizing activity to the respiratory system.

There is the possibility that the consumer may be exposed for a short time to the two acrylates when inhaling non-burned natural gas during ignition of the flame, specifically in older models of gas stoves. Under the assumption that 0.5 liter natural gas escapes before ignition of the flame and that this gas dilutes in an air volume of 1 m³ above the stove the concentration of natural gas in the air amounts to 0.05% which could be inhaled by the consumer.
The natural gas contains at maximum 7 ppm of the odorant. Correspondingly, for short periods of time the concentration of the odorant in the air above the stove could amount to a maximum of 0.0035 ppm.

For both ethylacrylate and methylacrylate a limitation of 5 ppm in the air at the workplace applies according to TRGS 900 ("Technical rules for dangerous substances") [13]. This level of 5 ppm corresponds to a maximum concentration of the acrylates in the breathable air at which no harm to health is to be expected even during long-term exposure. In the safety assessment of occupational exposure an 8-hour shift during five days per week and for the whole working life is considered.

The maximum concentration of the odorant in natural gas amounts to 7 ppm and thus corresponds approximately to the workplace limit according to TRGS 900. Based on the high dilution of the odorant in the air above the gas stove, which only could be inhaled during short periods of time, a safety margin of a factor of at least 1400 results for the consumer compared to the workplace limit. In view of the present experience in man and under the given conditions a sensitization by ethylacrylate or methylacrylate, specifically of the respiratory system, is not to be expected.

Dornach, 22. Januar 2009
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Literature