

# Risk of silicosis from the manufacture of artificial stone countertops with a high quartz content

In 2016, notified by the Emergence Working Group of the National Network for the Monitoring and Prevention of Occupational Diseases (RNV3P), ANSES alerted the Ministry of Labour of a risk of serious silicosis incurred by people working with **"artificial stone" containing between 70 and 90% quartz** embedded in epoxy or polyester resins (products described as "artificial stone", "high-silica-content artificial stone products", or "quartz conglomerates") [1].

These are high-end materials with excellent technical and aesthetic qualities, which can be through-coloured, and are mainly used for the manufacture of kitchen countertops, bathroom surfaces, sinks and washbasins, etc. While they are produced abroad (including by several suppliers in Europe), these materials are available for sale in France under various trade names (see Figure 1). Besides production, the exposed workers are mainly **stonemasons**. The high risk of silicosis was first identified in Israel in the production sector (25 cases requiring lung transplants [2]). Other cases were then observed that mainly concerned the shaping, sanding and installation of these products: in Spain (46 cases identified following the epidemiological investigation launched after the first three Spanish cases were reported) [3], Italy (7 cases), and Brazil.

In the United States, the occupational health and safety agencies (OASH<sup>1</sup> and NIOSH<sup>2</sup>) issued an alert in 2015 [4], following the documentation of a very serious case of silicosis (requiring a lung transplant) in a 37-year-old man with no previous medical history, after only ten years of exposure. NIOSH also noted that imports of these products have increased by 50% in recent years and that they are one of the most popular materials for kitchen and bathroom countertops. NIOSH's work found that three quarters of the 47 companies in the sector identified carried out at least one of the production steps in dry conditions (when the work should have been conducted under water to avoid dust inhalation) and that only 9% used appropriate methods for all steps [5]. Lastly, this exposure to artificial stone aerosols was associated with the occurrence of autoimmune diseases (a known risk associated with silica exposure) [6].

In France, the alert was issued to the DIRECCTEs<sup>3</sup>, CRAMs<sup>4</sup> and CARSATs<sup>5</sup> and to occupational physicians in the field. A first case of silicosis, identified in the RNV3P network following the ANSES alert, is currently under investigation.

In order to be able to identify future cases in the RNV3P, a new code for silica exposure from the machining of this type of material has been created.

Lastly, following this alert, ANSES issued an internal request to investigate the matter, setting up a "Crystalline Silica" Working Group tasked with updating knowledge on the hazards, exposures (occupational sector study) and risks associated with crystalline silica, and proposing risk reduction and prevention measures. The results of this work are expected in 2018.



**Photo 1:** Display unit showing different shades and finishes of artificial stone with a high silica content. (Source: photo by Vincent Bonneterre)

1. OASH: Office of the Assistant Secretary for Health
2. NIOSH: National Institute for Occupational Safety and Health
3. DIRECCTE: Regional Directorate for Business, Competition, Consumer Affairs, Labour and Employment
4. CRAM: Regional Health Insurance Fund
5. CARSAT: Occupational Health and Pension Insurance Fund

These materials have greater flexibility and can usually be machined on the same equipment used to cut wood. As a result, they are used more by **carpenters, fitters or processors approved by suppliers**.

One example is a material experiencing booming sales, which consists of two-thirds alumina trihydrate embedded in an acrylic resin (polymethyl methacrylate). It has several trade names (Corian®, Krion®, Avonite®). These composite materials containing smaller quantities of minerals are in principle less toxic than materials with a high crystalline silica content. Nevertheless, the machining and sanding of this material releases fine particles containing 85% aluminium trihydrate, 30% of which can penetrate the airways and deep into the lungs due to their particle size (peaks at 1 µm and 12 nm) [8]. Machining also causes the release of resin thermodegradation products with irritating properties (the thermodegradation of the resins explains their lower proportion in the particulate phase). Lastly, working with these materials requires the use of large quantities of methacrylic glues to bond the sheets together, fill the joints, etc. The very first sufficiently documented cases of respiratory diseases associated with this exposure were recently described. A first case of pulmonary fibrosis attributed to unprotected exposure to machining dust from this material was published in 2014 in the *New England Journal of Medicine* [7], and a first case of chronic obstructive pulmonary disease (COPD) in a patient working in France, with no other

risk factors, has been diagnosed (both cases were based on mineralogical analysis).

**In conclusion, with a view to increasing vigilance and secondary prevention (screening) in France**, this information needs to be brought to the attention of occupational physicians, preventionists and pulmonologists. If there is any doubt about a related occupational disease, the worker must be referred for investigation to one of the occupational disease consultation centres located in almost every university hospital centre in metropolitan France, and more recently in Reunion Island.

With regard to **primary prevention**, the machining of these types of materials, which offer both technical and aesthetic benefits, should undergo a risk assessment and be carried out under conditions that minimise inhalation. This means prioritising wet methods *for machining artificial stone* (a technique that is far less suited to workshops machining solid-surface materials, which often use the same machines for wood and plywood), as well as HEPA-filtered local exhaust ventilation and the wearing of an effective and suitable respiratory protection mask, particularly for tasks involving the most exposure (e.g. sanding with a hand-held tool on surfaces that are not horizontal).

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### References

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- [2] Kramer MR et al. Artificial stone silicosis: disease resurgence among artificial stone workers. *Chest*. 2012; 142(2):419-24.
- [3] Pérez-Alonso A, et al. Outbreak of silicosis in Spanish quartz conglomerate workers. *Int J Occup Environ Health*. 2014; 20(1):26-32.
- [4] Friedman GK, et al. Notes from the field: silicosis in a countertop fabricator - Texas, 2014. *MMWR Morb Mortal Wkly Rep*. 2015; 64(5):129-30.
- [5] Phillips ML, et al. Determinants of respirable silica exposure in stone countertop fabrication: a preliminary study. *J Occup Environ Hyg*. 2013;10(7):368-73.
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- [7] Gannon P, Rickard RW. Pulmonary fibrosis associated with aluminum trihydrate (Corian) dust. *N Engl J Med*. 2014;370(22):2156-7.
- [8] Qi C, et al. Dust from Cutting Corian®, a Solid-Surface Composite Material, in a Laboratory Testing System. *Ann Occup Hyg* 2016; 60(5): 638-642.

### TO FIND OUT MORE :

ANSES's Crystalline Silica WG

[https://www.anses.fr/fr/system/files/2016\\_01\\_GT\\_Silice\\_cristalline\\_role\\_et\\_missions.pdf](https://www.anses.fr/fr/system/files/2016_01_GT_Silice_cristalline_role_et_missions.pdf)

List of occupational disease consultation centres

<https://www.anses.fr/fr/system/files/RNV3P-CPP.pdf>