Health Hazards of Silicagel

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Commentary

ABSTRACT

Synthetic chemistry is one of the subdiscipline of organic chemistry involving synthesis of chemical compounds. One main element in the synthetic chemistry discipline is purification of the synthesised chemical mixtures. There are many ways to purify the chemical compounds but most preferred one is the chromatographic technique. Chromatography is technique of separating and analysing the components of a mixture of liquids or gases by selective adsorption on to the medium like paper, alumina, silica gel and more.

Out of all medium most preferred one is silica gel. Due to its amorphous and porous nature used for achieving a desired separation of certain molecular sizes. Due to silica gel’s polarity, non-polar components tend separate mixtures very cleanly.

But the question is it good to use silica gel to its maximum extent? Answer is NO. It causes lot of hazards to the human body. Most of the researchers from developing and poor countries use silica gel manually without knowing its Hazardous nature.

INTRODUCTION

Synthetic chemistry is a Branch of organic chemistry, involving synthesis of chemical compounds with various techniques. Purification of synthesized compounds with chromatography technique based on adsorption principle involving silica gel as a medium is a challenge due to silica gel hazardous nature [1-24].

Silica gel is a granular, vitreous, porous form of silicon dioxide made synthetically from sodium silicate. Silica gel is tough and hard. It is more solid than common household gels like gelatin or agar. It is a naturally occurring mineral that is purified and processed into either granular or beaded form. There are three types of Silica gel.

Type A - clear pellets, approximate pore diameter: 2.5 nm, drying and moisture proof properties are often used as catalyst carriers, adsorbents, separators and variable-pressure adsorbent.
Type B - clear white pellets pore diameter: four.5-7.0 nm, liquid adsorbents, drier and fragrance carriers, conjointly could also be used as catalyst carriers, cat litter.
Type C - clear, micro-pored structure, stuff for preparation of colloid cat litter. Additionally dried and screened, it forms macro-pored silica gel which is used as drier, adsorbent and catalyst carrier.
Silica gel's high specific surface area (around 800 m2/g) permits it to take up water easily, creating it helpful as a drier (drying agent) [25]. Silica gel is usually represented as "absorbing" wetness, which can be applicable once the gel's microscopic structure is unnoticed, as in silica gel packs or different product. But with chemicals, silica gel removes wetness by adsorbing onto the surface of its varied pores instead of by absorption into the majority of the gel.
Discussion

In chemistry, silica gel is used in chromatographic techniques as a stationary medium \[26\]. In column chromatography, the stationary phase is most often composed of silica gel. Different types of silica gel differing in particle sizes are used for achieving a desired separation of certain molecular sizes in chemical mixtures. Based on the polarity difference the silica gel is capable of separating the chemical mixtures.

The hydroxyl (OH) groups on the surface of silica can be functionalized to afford specialty silica gels that exhibit unique stationary phase parameters. These so-called functionalized silica gels are also used in organic synthesis and purification as insoluble reagents and scavengers. Chelating groups have also been covalently bound to silica gel. These materials have the ability to remove metal ions selectively from aqueous media. Chelating groups can be covalently bound to polyamines that have been grafted onto a silica gel surface producing a material of greater mechanical integrity. Silica gel is also combined with alkali metals to form an M-SG reducing agent.

Considering the above properties of silica gel researchers are inclined to use silica gel. In developed countries vast expansion of technology has bought sophisticated instruments for purifications of chemical mixtures involving silica gel. But developing and poor countries not in a position to afford such expensive instrumentation are adapted to the techniques involving usage of silica gel manually.

Due to the amorphous nature of silica it easily enters in to respiratory system of Human and causes lot of effects. Inhaling finely divided crystalline silica dust can lead to silicosis, bronchitis, or cancer, as the dust becomes lodged in the lungs and continuously irritates them, reducing lung capacities\[27-40\]. Studies of workers with exposure to crystalline silica have shown 10-fold higher than expected rates of lupus and other systemic autoimmune diseases compared to expected rates in the general population\[41-51\].

In the body crystalline silica particles do not dissolve over clinically relevant periods. Silica crystals inside the lungs can activate the NLRP3 inflammasome inside macrophages and dendritic cells and thereby result in processing of pro-Interleukin 1 beta into its mature form \[52-62\]. Chronic exposure to silica may thereby account for some of its health hazards, as interleukin-1 is a highly pro-inflammatory cytokine in the immune system \[63-77\]. This effect can create an occupational hazard for people working with sandblasting equipment, products that contain powdered crystalline silica and so on. Children, asthmatics of any age, allergy sufferers, and the elderly can be affected in much less time. Amorphous silica, such as fumed silica is not associated with development of silicosis, but may cause irreversible lung damage in some cases \[78\].

Considering above all as aspects it may not be a good idea to use silica gel as a regular lab chemical without taking safety precautions.

REFERENCES


