Solids

What is a solid?

Solids are one of the three fundamental states of matter, the others being liquids and gasses. The biggest and most noticeable difference between these states of matter is the shape and volume, solids have a fixed shape and volume making their forms difficult to change. Liquids also have a fixed volume but can freely flow to take the shape of their container. Gasses have no fixed shape or volume so they will completely fill whatever container they are in.

How can I identify if a chemical is a solid?

Solids can come as powders, pellets, shards, dust, or other particles and so they aren't always easy to identify, especially if you haven't seen the chemical hazard. However section 9 of an MSDS always states the aggregation state of the chemical being handled and this will identify the physical state of the chemical at room temperature (usually 23 °C (73 °F)). Section 9 of an MSDS will also mention the melting point of the chemical, this is a good way to see below which temperature the chemical is a solid because some chemicals are liquids at just above room temperature e.g. the metal gallium melts at just 30 °C (86 °F).

Do solids offer a permeation hazard?

Solids are not able to permeate materials and so almost every enquiry for a solid chemical will be estimated as a good permeation barrier. This goes back to the lack of a solids ability to flow, if the chemical can't freely move then the molecules are not free to permeate through another material.

If solids can't permeate, then what's the problem?

Although solids are not usually a permeation hazard they can penetrate protective clothing through holes, zips, seams or other openings in the materials. Solids can be toxic, corrosive and harmful for example sodium hydroxide or phosphoric acid, which are both solids when pure. Against the fabrics we would almost always expect a full permeation barrier against solids, this is because, as stated earlier, the molecules in solids are not free to permeate because they are fixed in a rigid structure. Exceptions are when the solids sublime (turn straight from a solid to a gas) or release a lot of vapors, in which case it is the gas that is permeating and not technically the solid. Some solids can take up moisture from the atmosphere to become more liquid and then cause a permeation hazard e.g. Potassium hydroxide.

What determines if a solid can penetrate protective clothing?

Unlike liquids or gasses the Major factor when trying to protect from solids is the particle size rather than what the chemical is. Solids will behave similarly when penetrating a material but what size they are will determine what size hole or imperfection they can use to bypass the protective barrier. Remember, the difference between penetration and permeation is that penetration is the chemical avoiding the barrier by moving through a hole, opening or imperfection, this happens on a relatively large scale (usually visual). Permeation is where the chemical can pass through the barrier on a molecular level and doesn't need there to be any holes but is based on the chemical properties of the chemicals and the barrier.

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What can be used to protect from solids?

Many of our suits are EN ISO 13982-1 “type 5” certified suits, this means they have undergone and passed tests to measure how much solid dust particulates can penetrate a whole suit while worn. Any of our suits that have been certified as EN Type 5 will possess the following symbol.

For more details on protection from solid particulates please see your local Ansell sales representative or visit our website: www.Ansell.com or www.microgard.com

Estimations of the barrier properties of fabrics are based on extrapolations from laboratory test results and information regarding the composition of the chemicals. Synergistic effects of mixing chemicals have not been accounted for. Estimations are subject to change if new testing is carried out providing better grounds for extrapolations. For these reasons, any information in this report must be advisory only and Ansell fully disclaims any liability including warranties related to any statement contained herein.