

Primer on Hydrophilic, Hydrophobic and Oleophobic Media

Hydrophilic: Hydrophilic means water loving. Most common filters use hydrophilic media. Examples of hydrophilic filters are that wet or “wet-out” with water which has a surface tension in the 72 dynes/cm range. Many other liquids easily wet-out hydrophilic media have a surface tension well below 72 dynes/cm, such as oil and chemicals. Oil and most chemicals typically have surface tension in the 20-50 dynes/cm range, so by the nature of having low surface tensions quickly wet hydrophilic media. Typically, hydrophilic liquid filters are used to filter water and most oil and chemicals. The most common hydrophilic materials include media constructed of cellulosic, nylon or polyethersulfone among others. When a water, oil or chemical droplet is placed on the surface of a hydrophilic media, it will immediately wet and penetrate the medium.

Hydrophobic: Hydrophobic means water fearing and often, but not always consist of polypropylene or fluoropolymer based filtration media. By their nature, hydrophobic filtration media will not wet-out when a droplet in water is applied to the surface; it will bead and sit without penetrating the medium. However, if the media has a treatment applied to the surface, the media can be rendered hydrophilic. Examples of post-treatments are surfactants, plasma and specialty chemicals, which bind to the surface. The purpose of the post-treatment is to permit polypropylene, fluoropolymers and other borderline polymers, like polyester, to wet-out when a water droplet is applied to the surface. There are situations when filter users want to use polypropylene and fluoropolymer media to filter water based fluids, such as acids, because of the pH resistance of these polymers. In such cases, to achieve flow, the water based acid fluids must have a pressure differential across the medium which exceeds the bubble point of the filtration media. In the case of a polypropylene nonwoven fabric, such as meltblown nonwoven fabric, the bubble point requires a relatively low 1-10 psi differential pressure, depending on the medium’s pore size. On the other hand, fluoropolymer membranes in the sub-micron range, differential pressure must be greater than 10-50 psi or higher, depending upon the pore size of the membrane, in order to override the medium’s bubble point. Typical uses for hydrophobic filters are where chemical compatibility of the media is required, such as with acids or as vents in pharmaceutical storage tank vents, vents on IV filters and a variety of other medical device or bottle top and battery vents.

Oleophobic: The term and use of oleophobic media is largely unknown to many in the filtration industry, but is used in a number of applications. Oleophobic filtration media is typically any filtration media that has a post-treatment that will not wet-out when an oil or chemical droplet is applied to a media creating a surface capable of repelling fluids as low as 20 dynes/cm. Again, like hydrophobic media, water will bead on the surface of the treated media, but so will oils and chemicals even those with low surface tensions. When fabricated into filters, oleophobic media will allow water, oils and chemicals to pass, assuming the differential pressure is high enough to exceed the bubble point of the media, similar to the situation above for hydrophobic media. Examples of oleophobic media uses are generally vents where oils and chemicals are typically present, including small motor vents under the hood in automobiles and trucks along with head and tail lamps of a car allowing moisture to escape, while preventing road oils from wetting and blinding off the medium for free air and moisture flow.

Keywords

Filtration Media

Coalescing

Air Filtration