MODULE 1: OVERVIEW OF NONWOVENS

Q7: Define nonwovens as per ISO 9092.

A7: As per ISO 9092, nonwoven is defined as a manufactured sheet, web or batt of directionally or randomly oriented fibers, bonded by friction, and/or cohesion and/or adhesion, excluding paper and products which are woven, knitted, tufted, stitch-bonded incorporating binding yarns or filaments or felted by wet-milling, whether or not additionally needled. The fibers may be of natural or man-made origin. They may be staple or continuous filaments or be formed in situ.

Note: To distinguish wet-laid nonwovens from wet-laid papers, a material shall be regarded as a nonwoven if

a) more than 50 % by mass of its fibrous content is made up of fibers (excluding chemically digested vegetable fibers) with a length to diameter ratio greater than 300; or, if the conditions in a) do not apply, then

b) If the following conditions are fulfilled:

more than 30 % by mass of its fibrous content is made up of fibers (excluding chemically digested vegetable fibers) with a length to diameter ratio greater than 300 and 2) its density is less than 0.40 g/cm3.

Q8: Define nonwovens as given by EDANA.

A8: EDANA has adopted the definition of nonwoven as per ISO 9092. As per ISO 9092, nonwoven is defined as a manufactured sheet, web or batt of directionally or randomly oriented fibers, bonded by friction, and/or cohesion and/or adhesion, excluding paper and products which are woven, knitted, tufted, stitch-bonded incorporating binding yarns or filaments or felted by wet-milling, whether or not additionally needled. The fibers may be of natural or man-made origin. They may be staple or continuous filaments or be formed in situ.

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more than 30 % by mass of its fibrous content is made up of fibers (excluding chemically digested vegetable fibers) with a length to diameter ratio greater than 300 and 2) its density is less than 0.40 g/cm3.

Q9: The traditional definition of fiber fineness does not truly reflect the fiber size. Justify.

A9: By fibre size we generally mean fibre cross-sectional area. It is known that the fineness *t* of a fibre is related to the fibre cross-sectional area *s* by the following relation $t = s\rho$, where ρ is fibre density. It can be then found that a 3 denier polyester fibre possesses cross-sectional area of 2.49×10^{-4} mm^2, but a 2.5 denier polypropylene fibre possesses cross-sectional area of 3.05×10^{-4} mm^2. What is follows is a coarser fibre has less cross-sectional area than a finer fibre. This contradictory result comes because of the influence of fibre density on fibre fineness. It is therefore often said that fiber fineness does not truly reflect the fiber size.

Q10: The specific surface area of a fibre is not a purely geometrical variable, but the surface area per unit volume of a fibre is a purely geometrical variable. Justify.

A10: The specific surface area a is given by $a = \frac{4(1+q)}{\rho d}$, where d of fibre diameter, q is fibre shape factor, and ρ is fibre mass density. Although fibre diameter and fibre shape factors are geometrical variables, but the fibre density is considered as a material variable, so the specific surface area of a fibre is not considered as purely geometrical variable. The surface area per unit mass λ is given by $\gamma = \frac{4(1+q)}{d}$. Evidently, it is a purely geometrical variable.

Q11: How would you characterize the anisotropy of fibre orientation?

A11: The anisotropy of fibre orientation can be characterized by the measure of anisotropy C which is defined by $C = \sqrt{f_{\max} / f_{\min}}$, where $f_{\max}$ denotes the maximum frequency and $f_{\min}$ indicates the minimum frequency.