

Bond Strength and Its Measurement in Nonwoven Fabrics

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Abstract

The geometrical properties of fiberweb nonwoven fabrics have been reviewed. Past studies have demonstrated the influence of fiber properties, web structure and binder properties on the mechanical properties of fiberweb fabrics. Bond strength of the fiberweb nonwovens has been recognized as an important contributor to these mechanical properties.

In the study reported here penetration of the fabric by a conical needle has been proposed as a way to measure "bond strength". An analytical model to measure the bond strength (in terms of energy to break a bond), based on the stochastic process of bond-point failure has been proposed.

The experiments conducted indicate that mechanical properties of resin bonded fabrics depend more so on the binder properties than on the fiber properties. The results showed that the "energy to rupture", measured by the needle penetration test, could be used to characterize the actual bond strength in resin bonded fiberwebs effectively.

Due to local differences inherent in the fiberweb geometry and areal density, the single needle penetration test was required to be repeated many times to obtain representative values. The multiple needle penetration test was therefore, developed to reduce the testing time. The results showed that the bond strength value obtained by the latter were effectively the same as those obtained by the former.