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NanoWeld® Technical Description & Specifications

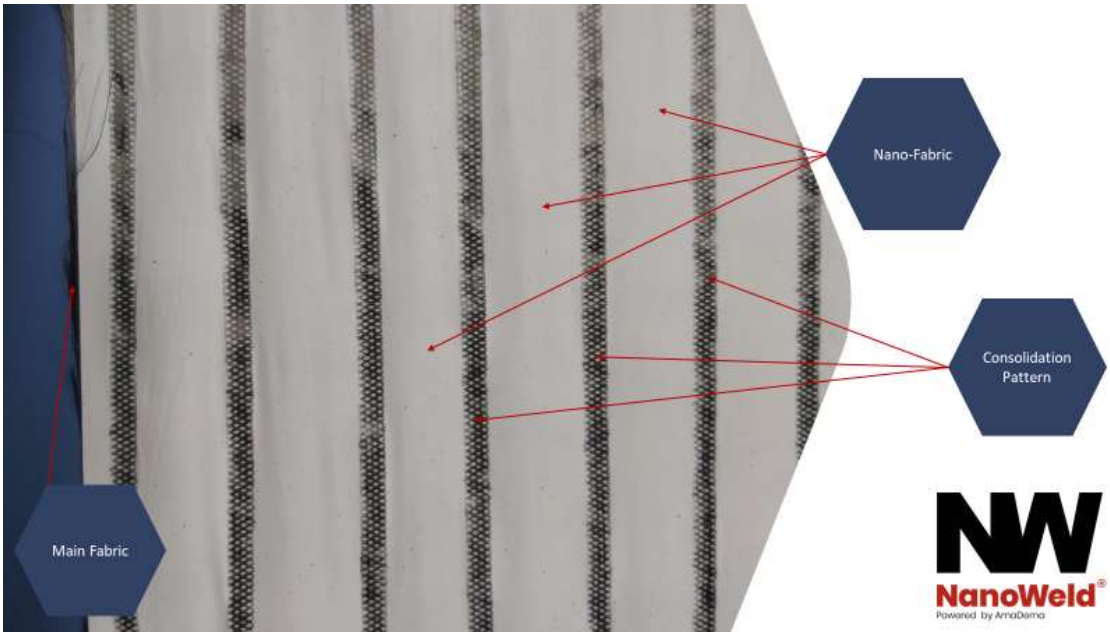


Figure 1

NanoWeld® enhances existing technical fabrics as well as prepregs offering superior mechanical performance to the resulting Carbon Fiber Reinforced Polymer Composites

NanoWeld® Technology consists of three distinct phases:

NanoCreation → NanoInsertion → NanoConsolidation

NanoCreation

The result of NanoCreation is the electrospun nanofabric. The Nanofabric (Figure 1, 2 and 3) has the following characteristics:

Material: Nanofabric material precursor is PA6. Different thermoplastic polymers have been optimized and can be used, such as PVDF or PAN or other depending on the application.

The nanofabric contains nanoparticles. These nanoparticles vary in terms of type and quantity again depending on the applications. Different nanoparticles have been optimized and can be used, such as Carbon-MWNTs, or Coper Nanowires, or graphene nanoplatelets or other

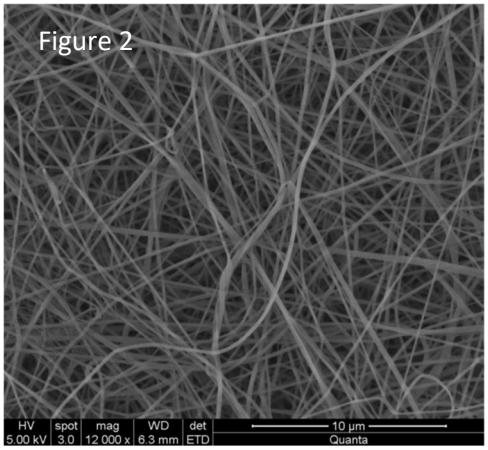


Figure 2

Specifications: The nonwoven nanofabric for composite applications has been optimized at:

- Nanofabric Areal density: 2 grams per square meter
- Nanofabric Thickness: 7 to 20 micrometers
- Nanofiber Average Diameter: 40 to 180 nanometers

NanoInsertion

The nanofabric is placed on top and on the bottom of the base-technical fabric to be enhanced

The base-technical fabric can be carbon or glass or aramid or other

The base-technical fabric can have a thickness from 95 micrometers up to 600 mircormeters.

The base-technical fabric can be of any knitting such as unidirectional, woven, biaxial or other.

The base- technical fabric which is enhanced in Figure 1 and 3 is a carbon fiber unidirectional fabric.

NanoConsolidation

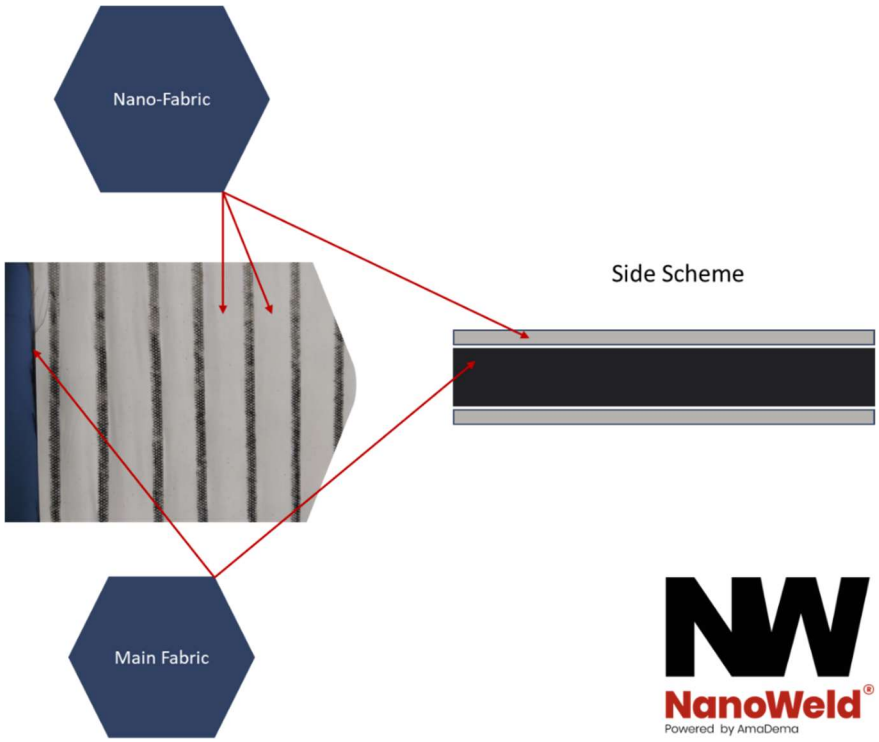
During NanoConsolidation the technical fabric is sandwiched by the top and bottom nanofabrics.

The NanoConsolidation is achieved through ultrasonic welding or thermocompression.

The pattern used for consolidation in Figure 1 and 3 is a stripped pattern with welding lines at a desired distance from each other. The pattern depending on the application can vary and it can include the entire surface of the sandwiched lamina.

Figure 3 demonstrates a schematic of the thickness of a NanoWeld®-enhanced carbon fiber lamina

Figure 3



Last figure presents an example of NanoWeld application for a unidirectional carbon fabric at 200gsm, demonstrating the increased mechanical performance of NanoWeld®-enhanced CFRPs compared to standard CFRPs in different mechanical properties. Testing has been performed in an independent accredited laboratory. More information on materials & testing can be provided upon request.

Figure 4