**Progress Achieved in Developing Conducting Basalt Fibre In the Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences**

Basalt fibre (BF) is an extremely fine and filamentous material made from basalt rock. Compared with E-glass fibre, BF exhibits much higher mechanical properties and better tolerance to temperature. The cost of BF is much lower than that of carbon fibre (CF), because the production of the former is based on the melting-drawing process, which is much simpler than that of the latter. Thanks to these advantages, BF has been used for various applications, including filtration, civil engineering, fibre-reinforced polymers (FRPs). The inherently insulating properties of basalt, however, limits the application of BF for conducting applications.

A research group led by Professor Peng-Cheng Ma from the Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, has made progress in developing conducting BF for sensory application. Collaborating with Professor Edith Mäder in the Leibniz Institute of Polymer Research Dresden in Germany, the team utilized BF as a substrate to deposit/grow various carbon-based nanoparticles on fibre surface. The results showed that by controlling the experimental conditions and utilizing the elements in BF, pyrolytic carbon (PyC) or carbon nanotubes (CNTs) were coated on BF surface. The introduction of these nanoparticles led to the turning of insulating BF to the conducting one. When a tow of the prepared BF was embedded into a polymer matrix, the corresponding FRP showed a positive piezoresistance under the mechanical deformation, i.e., the resistance of sample increased with increasing strain. Interestingly, the resistance change ($\Delta R/R_0$)-strain curve of FRP with PyC-BF showed an tilted-steps (Figure 1), indicating one after another failure of individually conductive fibres in composites, whereas those with CNT-BF exhibited a suddenly jumping behavior in electrical resistance because of the dissimilarities in conductive layer structure (Figure 2). The team further revealed that such behaviors were dominated by several factors, such as the composition and morphology of coating layer on BF surface, the formation of interface, and the wettability between the fibre and polymer matrix. The research output was published in Composites Part A: Applied Science and Manufacturing.

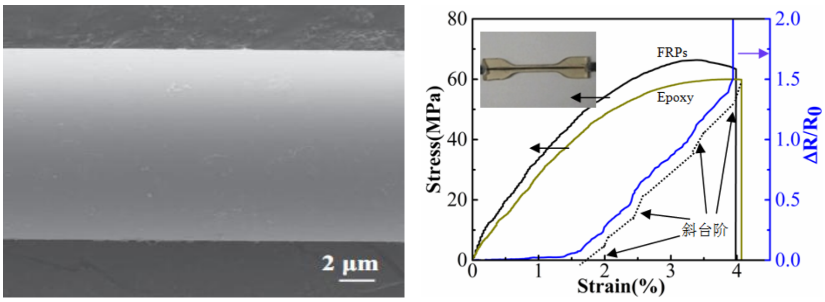


**Figure 1.** Basalt fibre with pyrolytic carbon coating and the piezoresistance of corresponding FRPs.

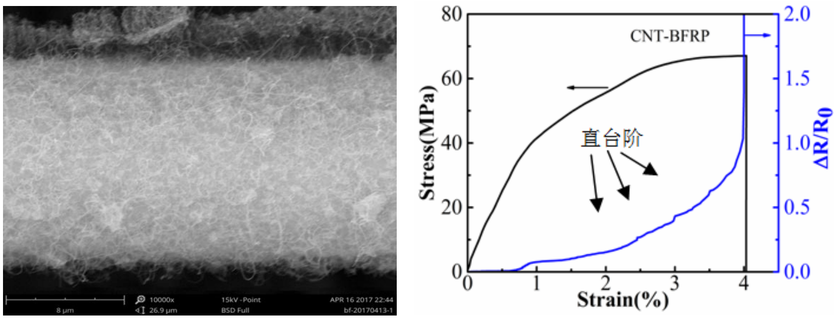

**Figure 2.** Basalt fibre with CNT coating and the piezoresistance of corresponding FRPs.

The novelty of this research lies in the turning of the insulating basalt-based fibre into the conducting one, thus significantly enhance the technical value of basalt fibre. Additionally, by utilizing the method developed by the team, it is possible to realize the production of fibre material with hierarchical structures. The developed material can be used as a potential material to regulate the interfacial strength between the fibre and matrix in FRPs. Part of research was presented during the International Conference on Composites Materials (ICCM-21) in Xi'An, China in August, 2017.

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