# Electrospun Ag/PVP/PMMA Porous Nanofibers for Monitoring Exhaled Diabetes Biomarker

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Routine blood glucose detection is desirable to recognize the early onset of diabetes mellitus. Glucose and fatty acids are the primary energy source for the body. When diabetic patients without sufficient insulin, it will force the liver to transform fat cells into fatty acids and ketones, including acetoacetate, β-hydroxybutyric acid, and acetone. Therefore, the acetone exchanged in the lungs' airways can be seen as the biomarker of diabetes. In this study, we developed a highly sensitive electrospun hierarchically channeled poly (methyl methacrylate) (PMMA) based nanofibrous materials. Polyvinylpyrrolidone (PVP) is an ideal sacrificial material because it can be readily removed by water etching. For the material designation, nanofibrous film with porous channel structures was prepared through a sequential process of electrospinning and water etching. Core-shell structure was obtained using PVA/PMMA as the shell and Ag/PVP as the sacrificial core. For the VOCs measurement, Ag/PVP/PMMA porous nanofibers were exposed to acetone in a container, and monitoring of the optical behavior for 30 min immediately. The extinction before and after VOC sensing was defined as extinction change (ΔE) to distinguish the existence of acetone. Ag/PVP/PMMA porous nanofibers with Ag surface plasmon resonance has a large specific surface area and poor mechanical properties, which allow the fiber to effectively absorb acetone vapor and cause the fiber to collapse, resulting in the enhancement of sensitivity. The response time of the Ag/PVP/PMMA porous nanofibers is 5 min when it is exposed to 10,000 ppm of VOCs. Finally, our study provides a sensing materials with high sensitivity and accuracy for monitoring exhaled diabetes biomarker.

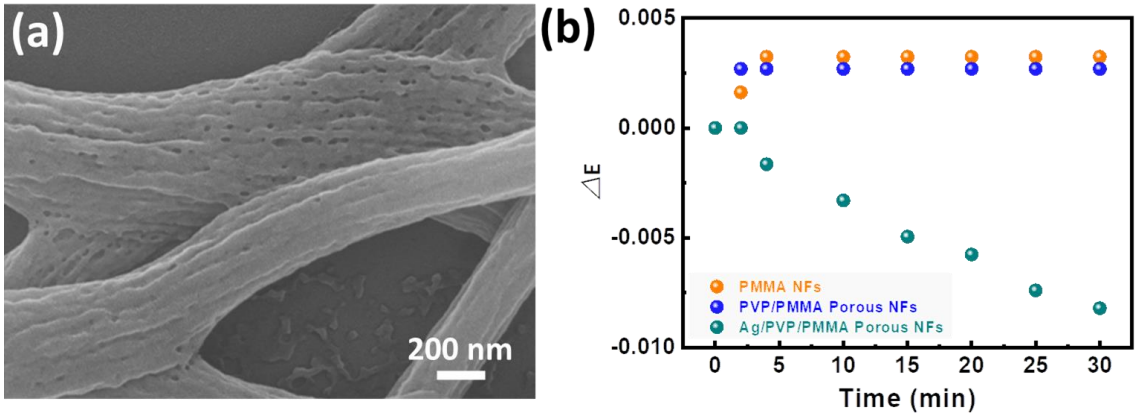


**Fig. (a)** SEM image of Ag/PVP/PMMA Porous NFs, and **(b)** the extinction changes of PMMA nanofibers, PVP/PMMA porous nanofibers, and Ag/PVP/PMMA porous nanofibers when exposed to 10,000 ppm of acetone.