

Polyvinyl Alcohol-*co*-Styrene Sulfonate/FeCl₂ Composite as Humidity Sensing Material

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Polyvinyl alcohol shows a significant impedance response with changing relative humidity (RH) only above 60% RH. Simply fabricated polyvinyl alcohol film as a humidity sensor lacks durability and also shows high impedance. To overcome this problem, polyvinyl alcohol was crosslinked with 4-styrene sulfonate (sodium salt) in the presence of ferrous ions. The best results with the material as a humidity sensor were obtained when polyvinyl alcohol was crosslinked with 4-styrene sulfonate in the presence of ferrous ions at a temperature of 140°C for about 1 h and when polyvinyl alcohol, 4-styrene sulfonate (sodium salt hydrate) and FeCl₂·4H₂O were used in a weight ratio of 10:2:3, respectively. The polymeric mixture of the three materials in water was cast on an alumina substrate (7.5 mm × 7.2 mm × 0.38 mm in size) prefabricated with interdigitized gold electrodes and was cured at a temperature of 140°C for 1 h. The results demonstrate that the logarithm of the impedance decreased linearly with increasing %RH in the range from 30 to 92% RH. Other factors, such as stability, sensitivity and response time for the fabricated sensor, were also determined.

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