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Sulfonated Fe_3O_4@SiO_2 nanorods incorporated sPVdF nanocomposite membranes for DMFC applications

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ABSTRACT

The magnetite needle like nanorods and its core-shell architecture with silica were incorporated into the sulfonated poly(vinylidene fluoride) (sPVdF) membrane and the influence of nanofillers towards direct methanol fuel cell (DMFC) performances was investigated in detail. The morphological properties enunciated that magnetite@silica needle like nanorods were uniformly distributed over the sPVdF matrix. The sulfonated magnetite@silica positively influenced the water uptake and ion exchange capacity values *via* its water adsorption and acidification characteristics, respectively. The hydrogen bonding exerted between the surface functional groups of sulfonated magnetite@silica and free water molecules promoted the ion conduction properties of sPVdF membrane. The tortuous pathways and narrower transportation channels of sPVdF/sulfonated magnetite@silica membrane limited the methanol permeation. By the synergetic combination of acidification of polymer and nanocomposite techniques, the existing