Galactomannan crosslinking in acidic and neutral pH

L. A. Cavalcante[1], C. C. Araújo[1], B. S. Batista[1], A. M. O. Lima[1], J. P. L. Morais[1], F. M. B. Amaral[2,3], M. P. F. Graça[3], F. Mendes[2], A. A. M. Macêdo[1]

[1]Federal Institute of Maranhão, Department of Higher Education, Imperatriz 65906-335, Maranhão, Brazil
[2]Polytechnic Institute of Coimbra, Coimbra Health School, Rua 5 de Outubro – S. Martinho do Bispo, Apartado 7006, 3046-854 Coimbra, Portugal
[3]I3N and Physics Department, University of Aveiro, Aveiro, Portugal
E-mail: jp.lmorais@outlook.com

Galactomannans (Gal) are storage polysaccharides found in various plant seeds, acting in energy reserve and water retention [1]. Among several applications, Gal can be applied as wound dressing, having healing capabilities [2]. However, this application required reducing the solubility of Gal, which can be done via cross-linking processes [3]. The pH variation in the crosslinking process of Gal can influence its swelling [4] suggesting that it can affect other properties. Hence, this work investigated the structural and dielectrical properties of Gal from *Adenanthera pavonina* L. in raw form (GR) and after crosslinking with Glutaraldehyde at pH values of 3, 5, and 7 (GC3, GC5 and GC7, respectively). Galactomannan samples were crosslinked with fixed glutaraldehyde concentration of 2.0 mol/L in the form of films and sponges via slow solvent evaporation. All samples were characterized via Fourier transform infrared (FTIR) spectroscopy at wavenumber range of 4000 cm^{-1} – 400 cm^{-1} and via impedance spectroscopy (IS) in room temperature at frequency range of 100 Hz – 1 MHz with 1 V signal amplitude and 20 samples per decade. FTIR spectra of the crosslinked samples presented wavenumber shifts and reduced intensity in some absorption bands compared to raw galactomannan, mainly due to a greater polymer chain tangling in the crosslinked samples, which reduced the intensity of the respective absorption bands [5]. IS spectra showed a mainly capacitive behavior for GR, with relative permittivity between 8.8 (100 Hz) and 8.1 (1 MHz) and loss tangent below 0.01 at all measured frequencies. The crosslinked samples presented bigger relative permittivity at 100 Hz (74.4 for GC3, 31.5 for GC5 and 22.4 for GC7) which decreased at 1 MHz to 7.4 (GC3), 6.4 (GC5) and 5.3 (GC7), and presented bigger loss tangent at all measured frequencies (between 1.13 and 0.08). This increase in both quantities can be attributed to the greater polymer chain tangling detected in FTIR spectra and is amplified with pH value reduction, indicating that crosslinking Gal in acidic conditions can increase its conductivity.

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