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Determination of the degree of polymerization of inulin using different analytical methodologies

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This study discusses and shows as to determine the degree of polymerization (DP) of inulin, exemplified by samples obtained from roots of Brazilian medicinal plants as *Stevia rebaudiana* and *Pfaffia glomerata*, using different analytical methodologies as colorimetric methods, gel permeation chromatography coupled to multiangle laser light scattering and refractive index detectors (GPC/MALLS), nuclear magnetic resonance (NMR), gas chromatography coupled mass spectrometry (GC/MS), electron spray ionization mass spectrometry (ESI/MS) and matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALDI-TOF MS). It will be shown that these techniques and others can be used together to give complementary information thus providing a more accurate estimate of the overall DP of the inulin like molecules.

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Well-defined conjugated macroelectrolytes as efficient interlayers for organic optoelectronics

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The inverted device architecture of polymer solar cell (i-PSCs) is an attractive approach for its superior long-term stability compared to the initially implemented conventional device structures. To facilitate charge extraction, electron-collecting (EC) interlayer is highly demanded since commonly utilized Indium Tin Oxide (ITO) is not regarded as good EC electrode due to its high work function. Both conjugated and non-conjugated polyelectrolytes (CPE and NCPE) have been demonstrated as promising EC-interlayer materials for i-PSCs. Starburst molecules are well-known featured as well-defined chemical structure, high purity, excellent reproducibility, good solution processibility, and generally resulting superior optoelectronic properties. Such promising characteristics of monodisperse macromolecules make it rather attractive for organic optoelectronic applications. We have successfully fabricated i-PSCs using TrNBr and TrOH, two monodisperse star-shaped conjugated macro-electrolytes as EC interlayers on the top of ITO electrode substrates. The device structure is ITO/EC-interlayer/P3HT:ICBA/V2O5/Ag. The thickness of each interlayer was tuned carefully, exhibiting an optimized PCE for a thickness of ~2.4 nm in the case of TrNBr and of ~8.7 nm in the case of TrOH. Following optimization the solar cells devices delivered a maximum PCE of 4.88% (when TrNBr was used) and of 4.74% (when TrOH was used) with the benefit of avoiding the requirement for reactive metals to be used as EC-electrodes; that is an improvement of more than 20% in respect to the conventional Ca/Al reference devices. In comparison to the sol-gel derived ZnO based inverted devices; the enhancement in PCE was of 16% and 13%. The utilization of the star-shaped conjugated macro-electrolytes as interlayers in iPSCs resulted in the increase of the device stability when compared with devices of conventional geometry. Advantageously, the solution-processable character of these interlayer materials and their easy processing at low-temperatures in ambient atmosphere, offer a great promise for their incorporation in PSC device fabrication for commercial applications.

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