## SUPPORTING INFORMATION

# Innovative route for the preparation of high-performance polyolefin materials based on unique dendrimeric silica particles

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## Nitrogen sorption measurements of the silica nanospheres

Nitrogen sorption measurements were carried out to characterize the BET surface area and total pore volume of the siliceous material. Its pore size distribution (PSD) was then determined by applying the BJH theory to the nitrogen sorption isotherm data obtained for the dendrimeric silica nanospheres. Figure S1 represents the nitrogen sorption isotherm and the resulting PSD in the left and right plots, respectively. The results confirm a bimodal pore size distribution with two main populations of pores, with maxima at approximately 3 and 23 nanometers, respectively.
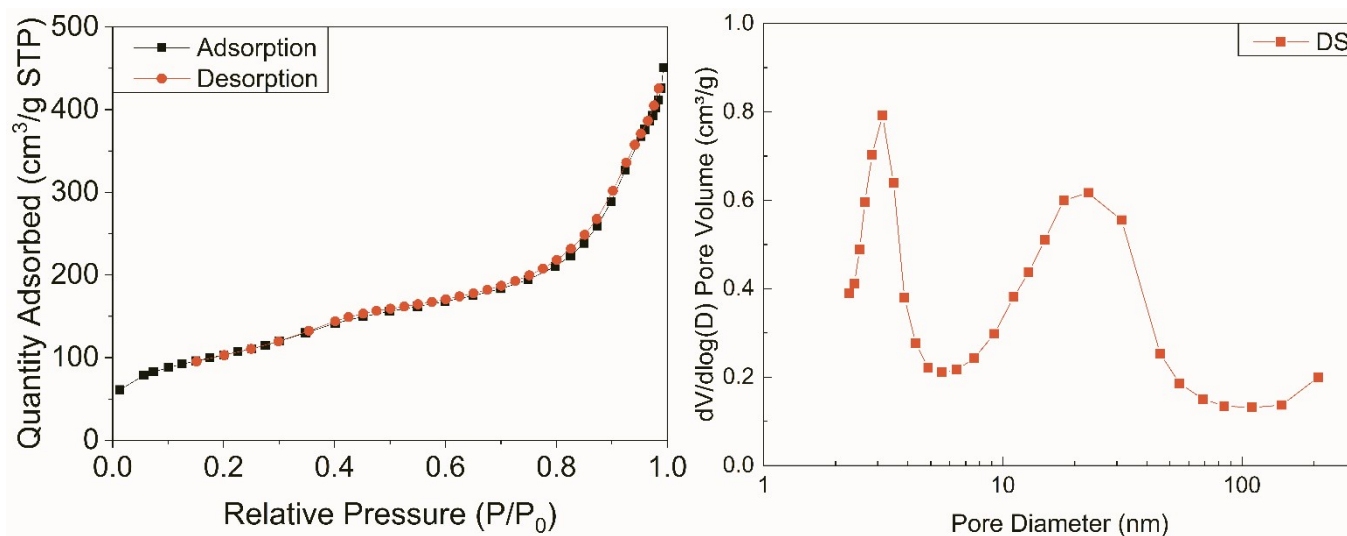


Figure S1 – Nitrogen sorption isotherm (left) and BJH pore size distribution (right) of the DS nanospheres.

## SEC characterization of the polymers

The average molar mass of the polymers produced via the different procedures was ascertained via high temperature SEC. Figure S2 contains the SEC obtained molar mass curves after treatment with the respective PS standards. All curves show a unimodal distribution of molar masses with narrow dispersity.
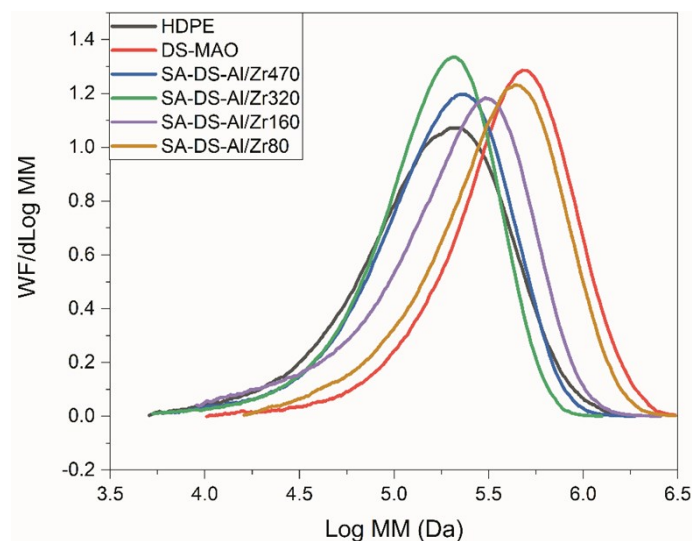


Figure S2 – HT-SEC chromatograms of the polymers produced with the SA-DS and DS-MAO methods, as well as a reference HDPE prepared via solution polymerization.

## DSC characterization of the polymers

Differential scanning calorimetry was employed to characterize the crystallinity, melting and crystallization behavior of the differente samples. Figure S3 represents the first and second melting transition for all samples, and Figure S4 represents the intermediate crystallization transition. All samples present a single melting peak apart from sample SA-DS-Al/Zr470 that presents a smaller peak at lower temperatures during the first melting transition. The absence of the samples' second peak on the second transition suggests that its existence is due to crystallization phenomena during polymerization.
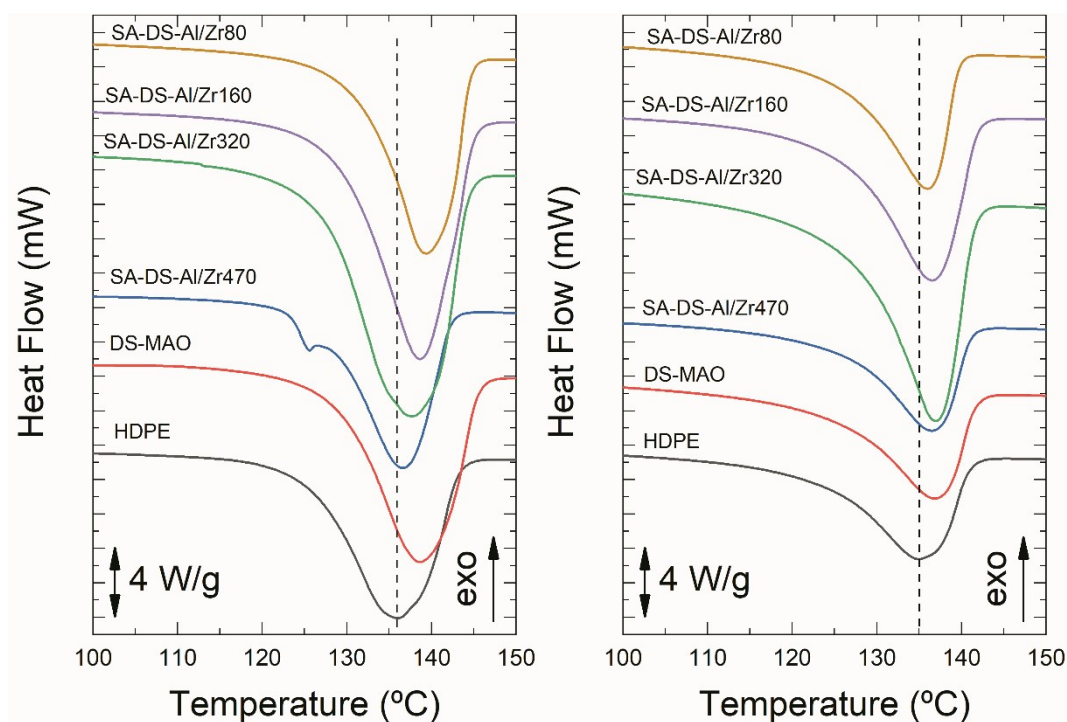
Figure S3 – DSC curves of the first melting transition (left) and second melting transition (right) of the polymers produced with SA-DS and DS-MAO methods, as well as a reference HDPE prepared via solution polymerization.
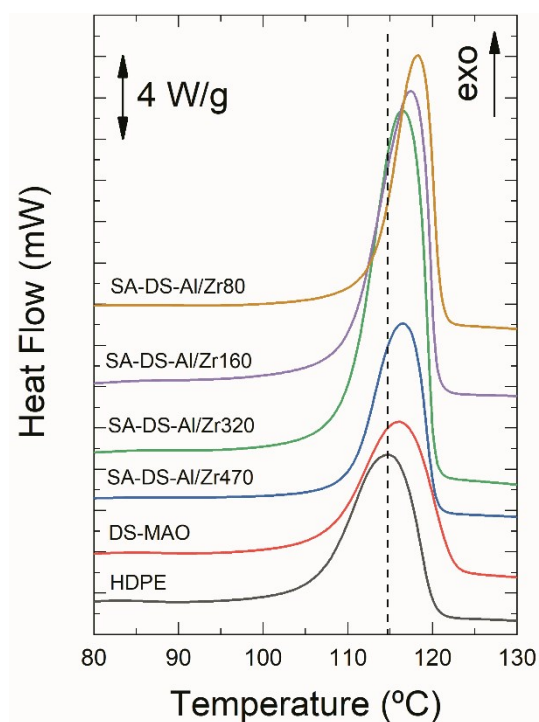


Figure S4 - DSC curves of the crystallization transition of the polymers produced with SA-DS and DS-MAO methods, as well as a reference HDPE prepared via solution polymerization.