NLDFT mesopore size distribution

Figure S1 shows the NLDFT analysis of the nitrogen isotherms for the mesopore range of pore size distribution – extending the pore size distribution shown in Figure 2C (main article) to 50 nm.

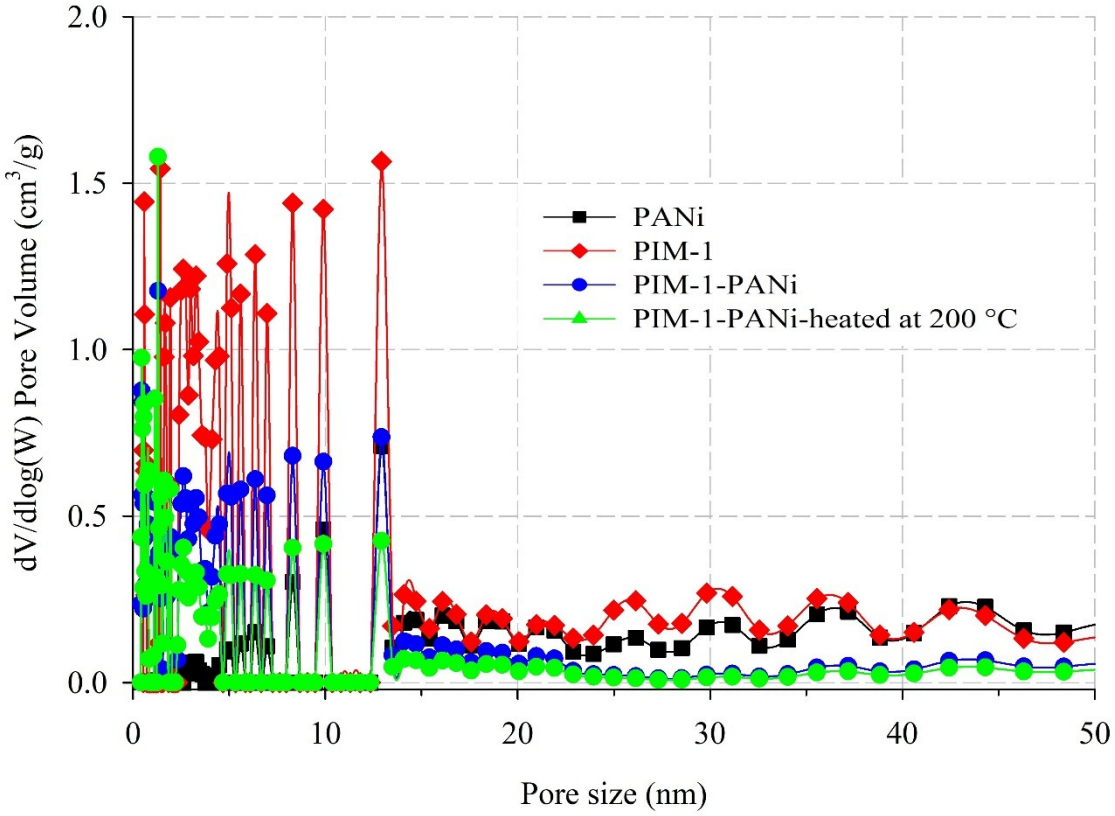

Figure S1: Pore size distribution to 50 nm calculated by NLDFT (model: slit-pore geometry for carbon).

NMR Results for PIM-1-PANi polymer composite

Solution state NMR spectra were acquired for PIM-1 on a Bruker Avance NEO 400 in $CDCl_3$ solution (300K). Chemical shifts were referenced to solvent residuals, taken as 7.23ppm (^1H) and 77ppm (^{13}C). The heteronuclear multiple bond correlation experiment was acquired using the hmbcgpl2ndqf sequence, available in the Topspin 4.0 NMR software package. Spectral processing was achieved using MNova 11. Solid state ^{13}C CP-MAS NMR spectra (75MHz) were obtained for PIM-1, PANi and PIM-1-PANi polymers using an Agilent VNMRS 300 spectrometer. Each sample was loaded into a 7 mm OD silicon nitride rotor and spun at the magic angle at a frequency of 5 kHz. CPMAS experiments employed the tancpx sequence (VNMRJ 3.1). Spectra were referenced to external hexamethyl benzene.

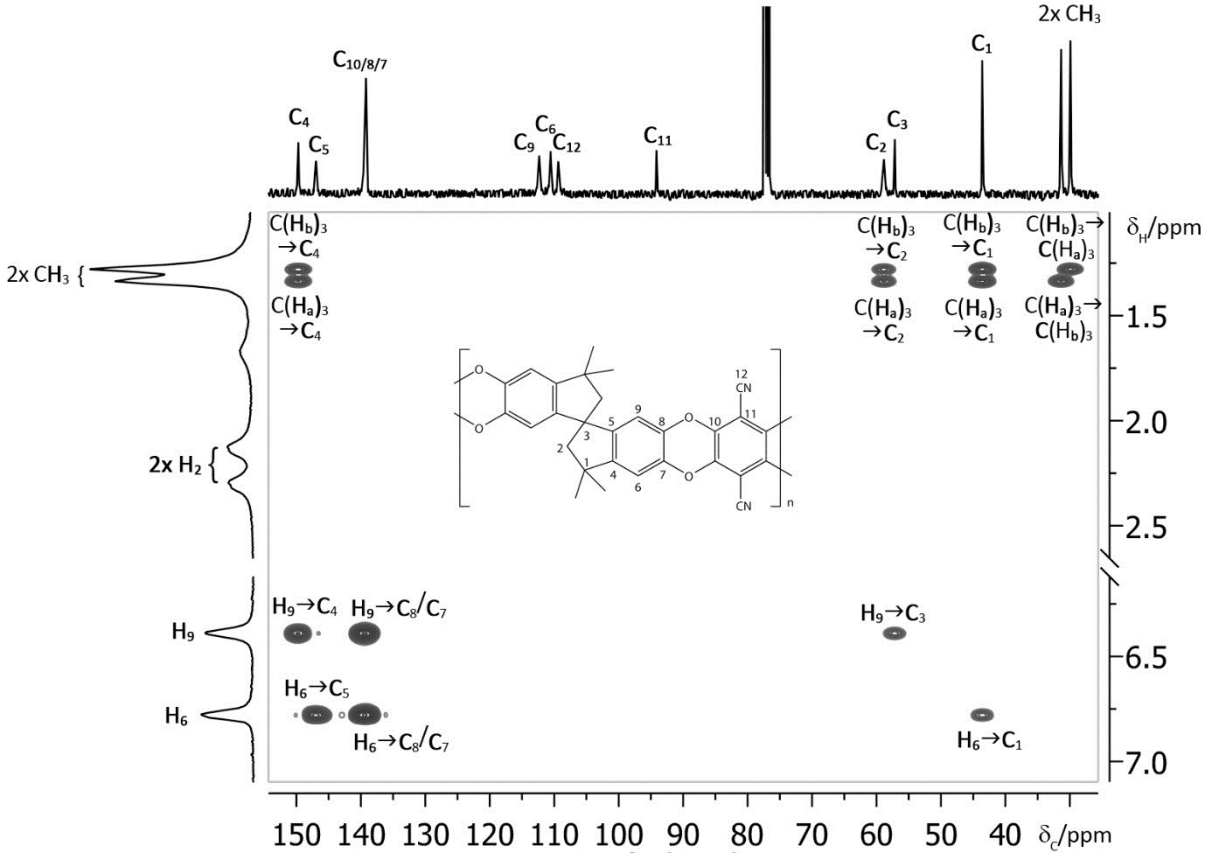

Figure S2 Expansions of the gHMBC spectrum (400MHz, 300K, $CDCl_3$) obtained for PIM-1. ^1H NMR (400MHz, 300K, $CDCl_3$) and $^{13}C\{^1H\}$ NMR spectra (100MHz, 300K, $CDCl_3$) are provided as axes references. All spectra are referenced to $CDCl_3$ solvent residuals; taken as 7.23ppm (^1H) and 77.0ppm (^{13}C) respectively. Assignments are illustrated.

^{1}H and ^{13}C NMR studies were conducted on a $CDCl_3$ solution of PIM-1. Assignments were as expected, and consistent with literature values. [1-3] Assignments are as illustrated in Figure S2. Solid-state ^{13}C CP-MAS NMR spectra were conducted on the PIM-1 and PANi polymers and a 9:1 mixture of the two compounds (Figure S3 (a)-(c).) Assignments for the two pure compounds (Figure S3 (a) and (b)) were consistent with literature values. [2, 3, 5-7] Identification of PANi resonances (the minor component) within the mixed material (Figure S3(c)) was hampered however, as most PANi resonance regions were coincident with/obscured by PIM-1 resonances and/or their associated spinning side bands. Only a single PANi resonance is clearly discernible in the spectrum of the mixed material. No resonances were observable in the spectrum of the δ_c mixed material however, that were inconsistent with a mixture of the component polymers.

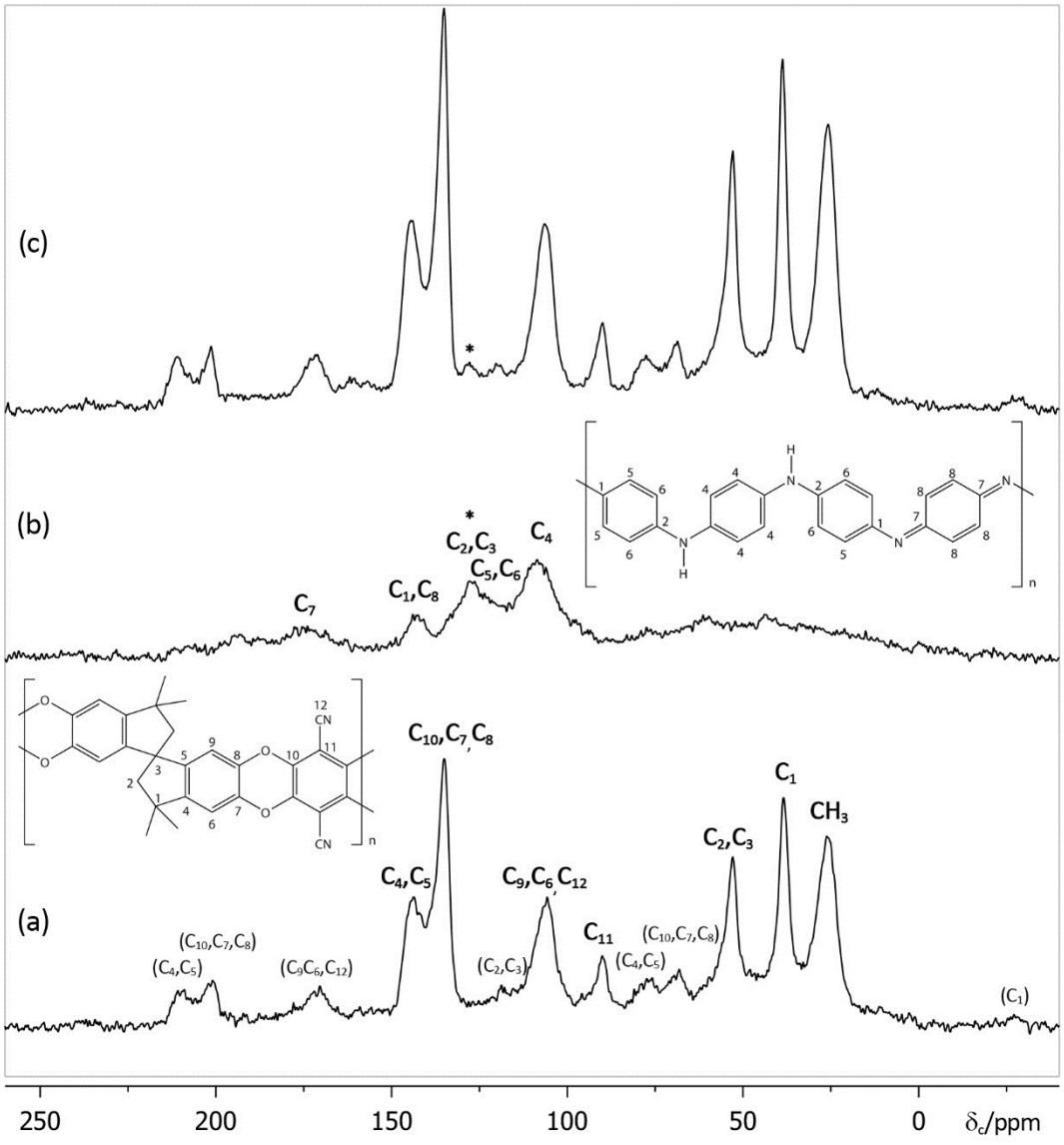

Figure S3 ^{13}C CPMAS spectra (75MHz, 5kHz) obtained for (a) PIM-1 (b) PANi and (c) a 9:1 mixture of PIM-1 and PANi. Assignments are illustrated for the pure materials; assignments shown in brackets in (a) are identifiable spinning sidebands. * indicates the identifiable/isolated PANi resonance in the PIM-1-PANi mixture.

Figure S4 shows that in the annealed composite polymer, this PANi peak has disappeared, indicating some modification of the PANi polymer during annealing at 200 °C for 4 hours.

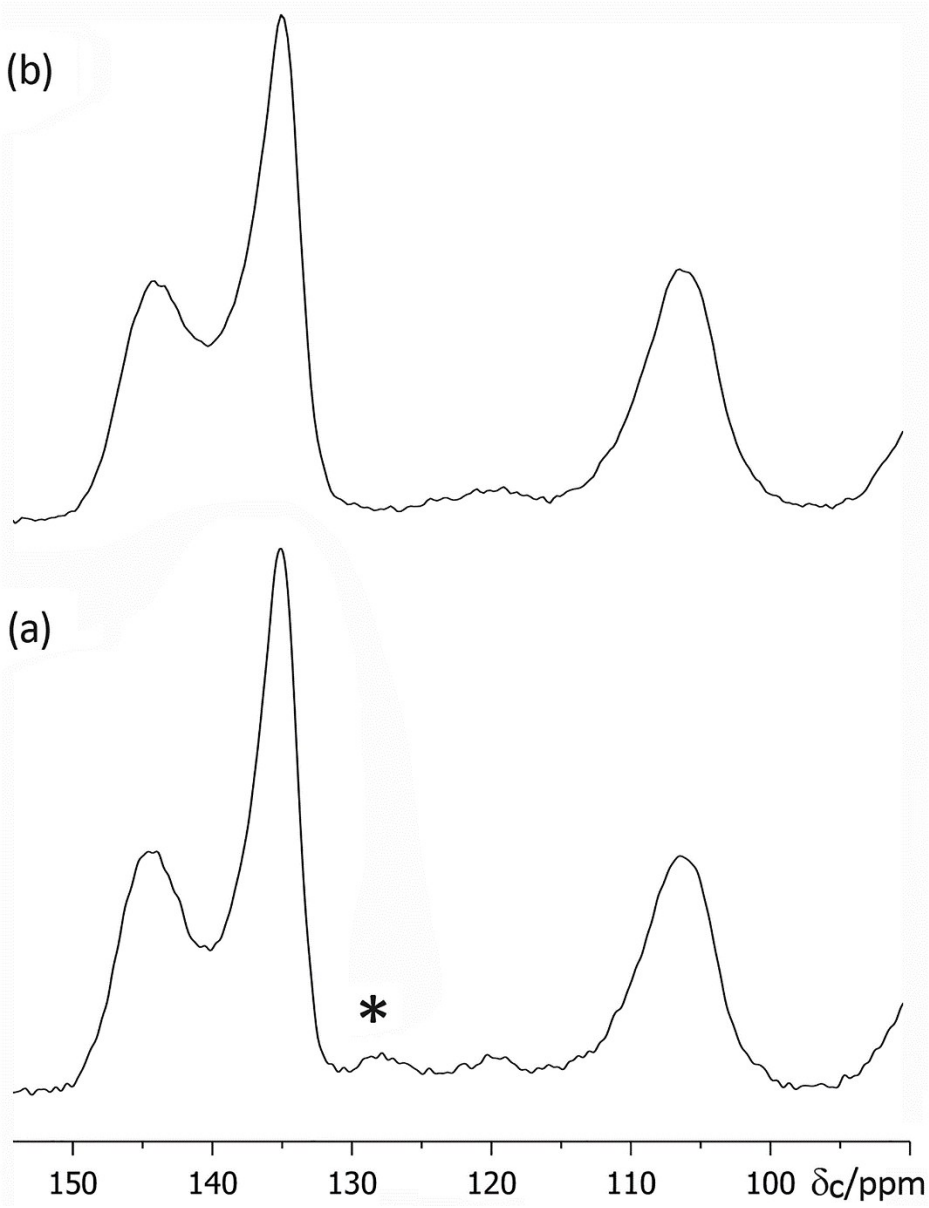

Figure S4 Expansions of the ^{13}C CPMAS spectra (75MHz, 5kHz, RT) obtained for (a) a 9:1 mixture of PIM-1 and PANi and (b) a 9:1 mixture of PIM-1 and PANi annealed at 200 °C for 4 hours under vacuum, highlighting the resonance assigned to the C2/C3 quarternary carbons adjacent to the amine substituent of the PANi component (*) [4].

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