Supplementary Information

Anomalies in the Low Frequency Vibrational Density of States for a

Polymer with Intrinsic Microporosity – The Boson Peak of PIM-1

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Calculation of the neutron cross sections per monomer

Table S1. Calculation of the neutron cross sections per monomer (coherent scattering, incoherent scattering and absorption) for PIM-1. 1 barn = 10^{-24} cm^2. The first column of each type of cross section contains the tabulated bound cross section for a single nucleus. The second column shows the contribution of all atoms of that type in the monomer. Absorption cross sections are scaled to the wavelength actually used, 5 Å, from the tabulated reference, 1.8 Å.

Atom	Number	σ_{coh} [barn]		σ_{inc} [barn]		σ_{abs} [barn]	
C	29	5.551	160.98	0.001	0.03	0.0035	0.28
H	22	1.7568	38.65	80.26	1765.72	0.3326	20.33
O	4	4.232	16.93	0.0008	0.003	0.00019	0.002
N	2	11.01	22.02	0.50	1.00	1.90	10.56
Monomer			238.58		1766.75		31.17

Table S2. Calculation of the macroscopic neutron cross sections (coherent scattering, incoherent scattering and absorption) for PIM-1.

Mass density [g/cm^3]	1.210
Monomer mass [g/mol]	462.51
Monomer density [nm^{-3}]	1.5755
Σ_{coh} [mm^{-1}]	0.0376
Σ_{inc} [mm^{-1}]	0.2783
Σ_{sca} [mm^{-1}]	0.3159
Σ_{abs} [mm^{-1}]	0.0049
Σ_{tot} [mm^{-1}]	0.3208

Table S3. Calculation of the neutron cross sections per monomer (coherent scattering, incoherent scattering and absorption) for Matrimid. 1 barn = 10^{-24} cm^2. The first column of each type of cross section contains the tabulated bound cross section for a single nucleus. The second column shows the contribution of all atoms of that type in the monomer. Absorption cross sections are scaled to the wavelength actually used, 5 Å, from the tabulated reference, 1.8 Å.
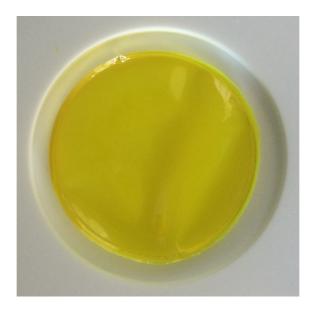
Atom	Number	σ_{coh} [barn]		σ_{inc} [barn]		σ_{abs} [barn]	
C	35	5.551	194.29	0.001	0.04	0.0035	0.34
H	26	1.7568	45.68	80.26	2086.76	0.3326	24.02
O	5	4.232	21.16	0.0008	0.004	0.00019	0.003
N	2	11.01	22.02	0.50	1.00	1.90	10.56
Monomer			238.14		2087.80		34.92

Table S4. Calculation of the macroscopic neutron cross sections (coherent scattering, incoherent scattering and absorption) for Matrimid.

Mass density [g/cm^3]	1.240
Monomer mass [g/mol]	554.61
Monomer density [nm^{-3}]	1.3464
Σ_{coh} [mm^{-1}]	0.0381
Σ_{inc} [mm^{-1}]	0.2811
Σ_{sca} [mm^{-1}]	0.3192
Σ_{abs} [mm^{-1}]	0.0047
Σ_{tot} [mm^{-1}]	0.3239

Photograph of a cast PIM-1 film

Figure S1. Photograph of a cast PIM-1 film (approx. 70mm diameter, 200 μm thickness)

The color of a cast PIM-1 film is yellowish and not completely transparent. Furthermore the yellow color indicates that PIM-1 absorbs in the blue wave length range of the light spectrum. These properties of PIM-1 prevent Brillouin scattering experiments to measure the transverse sound velocity. Such measurements require a fully transparent sample with no absorption or fluorescence.