Polyaromatic cores for the exfoliation of popular 2D materials

Electronic Supplementary Information

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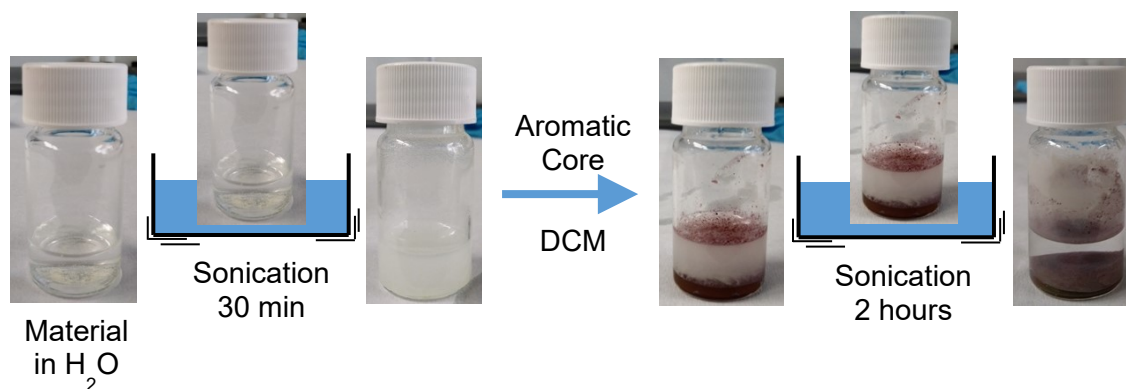
Supplementary figures

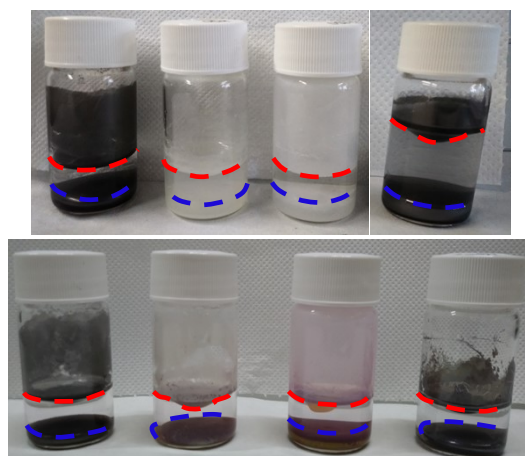**Figure S1.** Schematic representation of the exfoliation method.

Figure S2. Image of the biphasic systems after the exfoliation process. In the upper part are shown graphite, g-C$_3$N$_4$, BN and MoS$_2$ in the presence of **C$_{10}$-NDI-C$_{10}$**. In the bottom part are shown graphite, g-C$_3$N$_4$, BN and MoS$_2$ in the presence of **C$_{10}$-PDI-C$_{10}$**. In blue is marked the level of the organic phase (DCM) and in red the level of the aqueous phase.

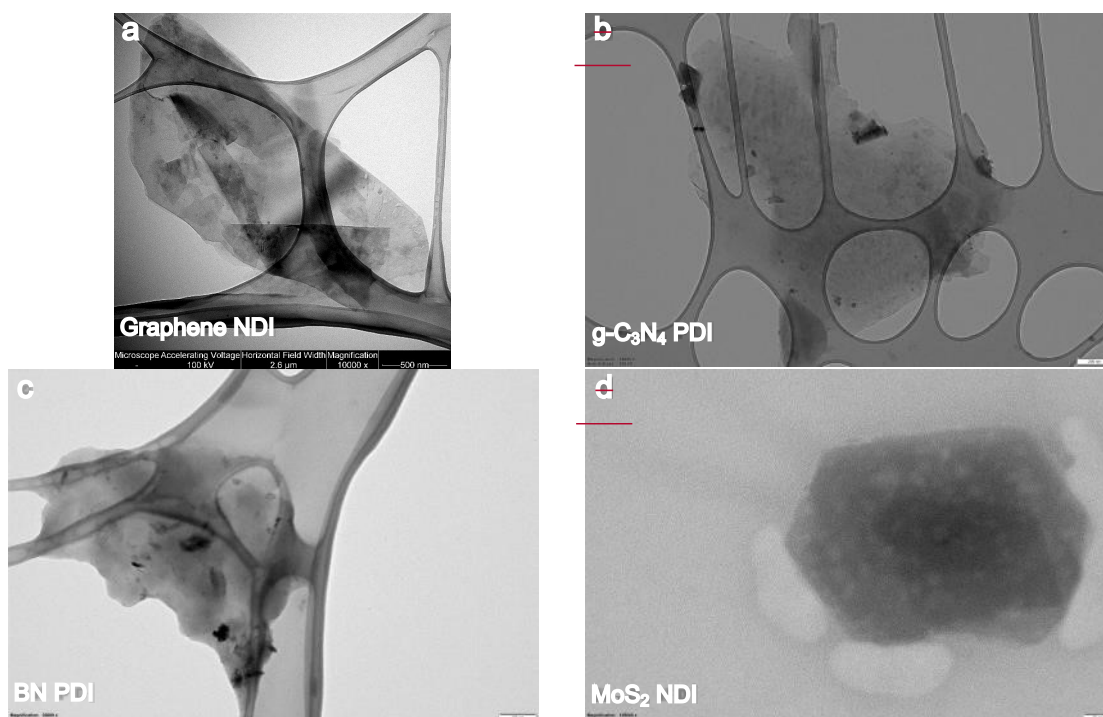**Figure S3.** TEM images of a) graphene and d) MoS$_2$ exfoliated in the presence of **C$_{10}$-NDI-C$_{10}$**, b) g-C$_3$N$_4$ and c) BN exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$**. The scale bares are 500 nm for graphene, 200 nm for g-C$_3$N$_4$, 100 for BN and 20 nm for MoS$_2$.
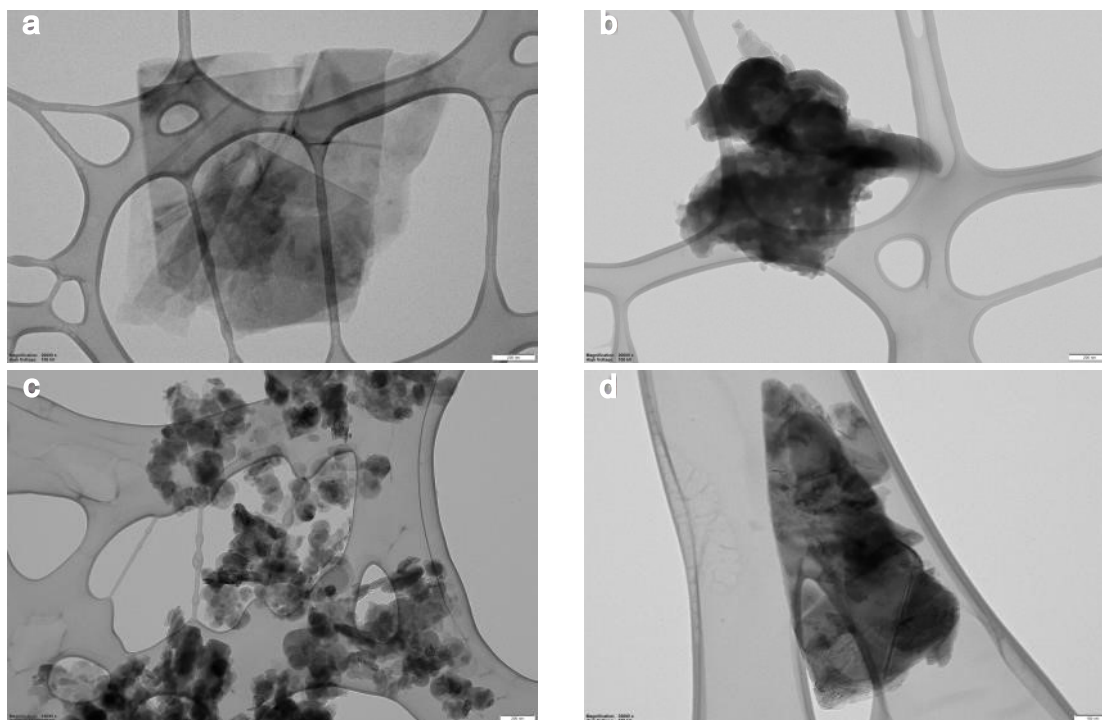
Figure S4. TEM images of a) graphene, b) g-C$_3$N$_4$, c) BN and d) MoS$_2$ exfoliated in the absence of the aromatic molecules **C$_{10}$-NDI-C$_{10}$** or **C$_{10}$-PDI-C$_{10}$**. The scale bares are 200 nm for graphene, g-C$_3$N$_4$, BN and 100 nm for MoS$_2$.
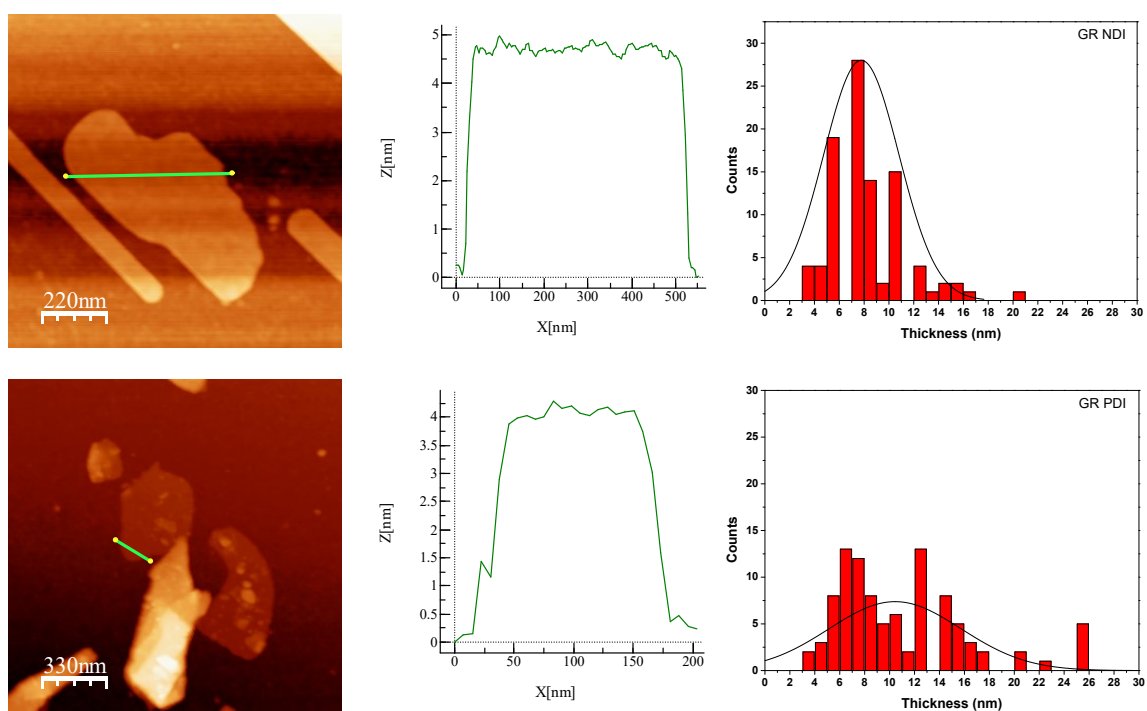

Figure S5. Exfoliation of graphene. Upper part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of graphene exfoliated in the presence of **C$_{10}$-NDI-C$_{10}$**. Lower part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of graphene exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$**.
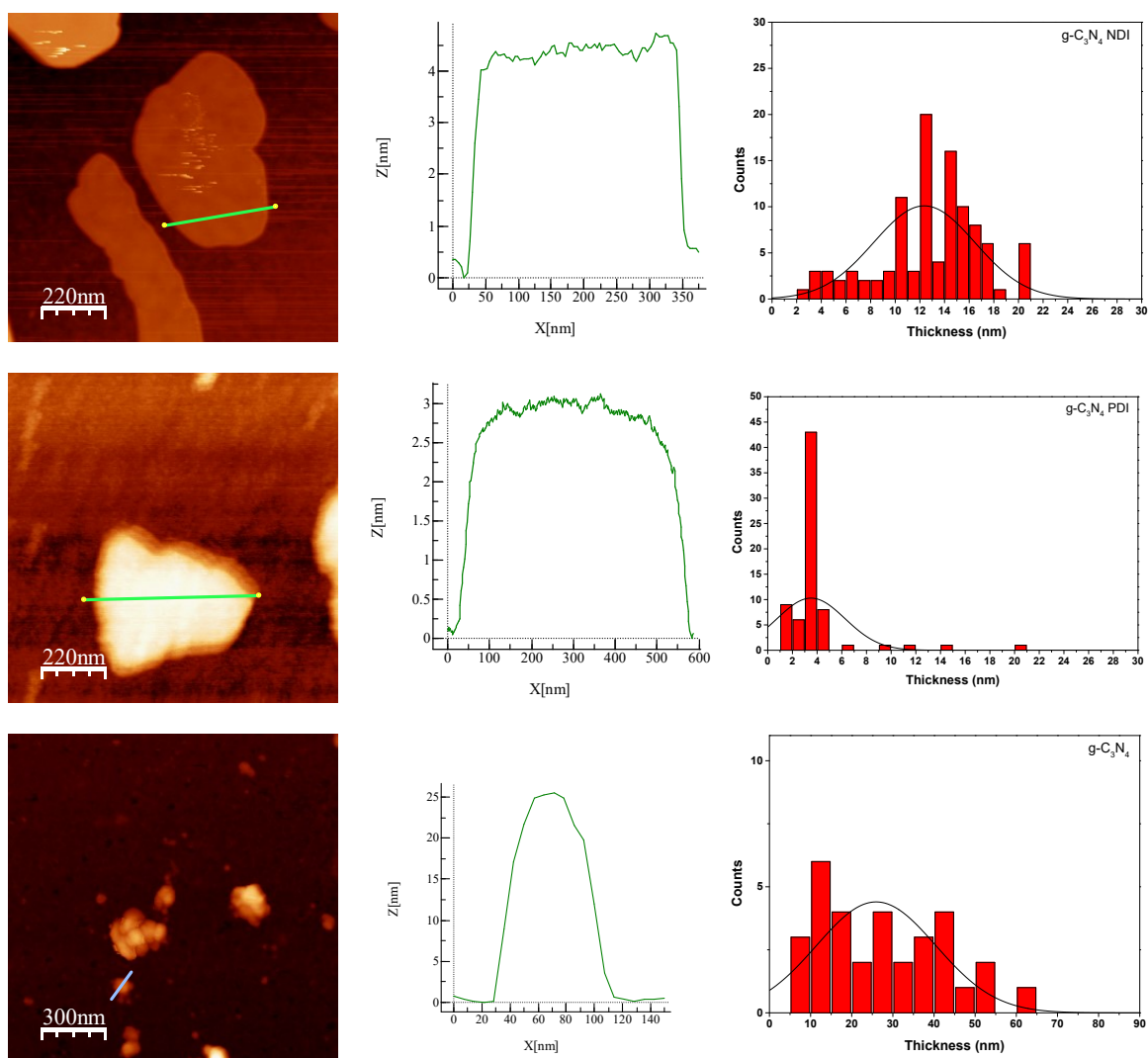
Figure S6. Exfoliation of g-C$_3$N$_4$. Upper part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of g-C$_3$N$_4$ exfoliated in the presence of **C$_{10}$-NDI-C$_{10}$**. Middle part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of g-C$_3$N$_4$ exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$**. Lower part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of g-C$_3$N$_4$ exfoliated in the absence of the aromatic cores.
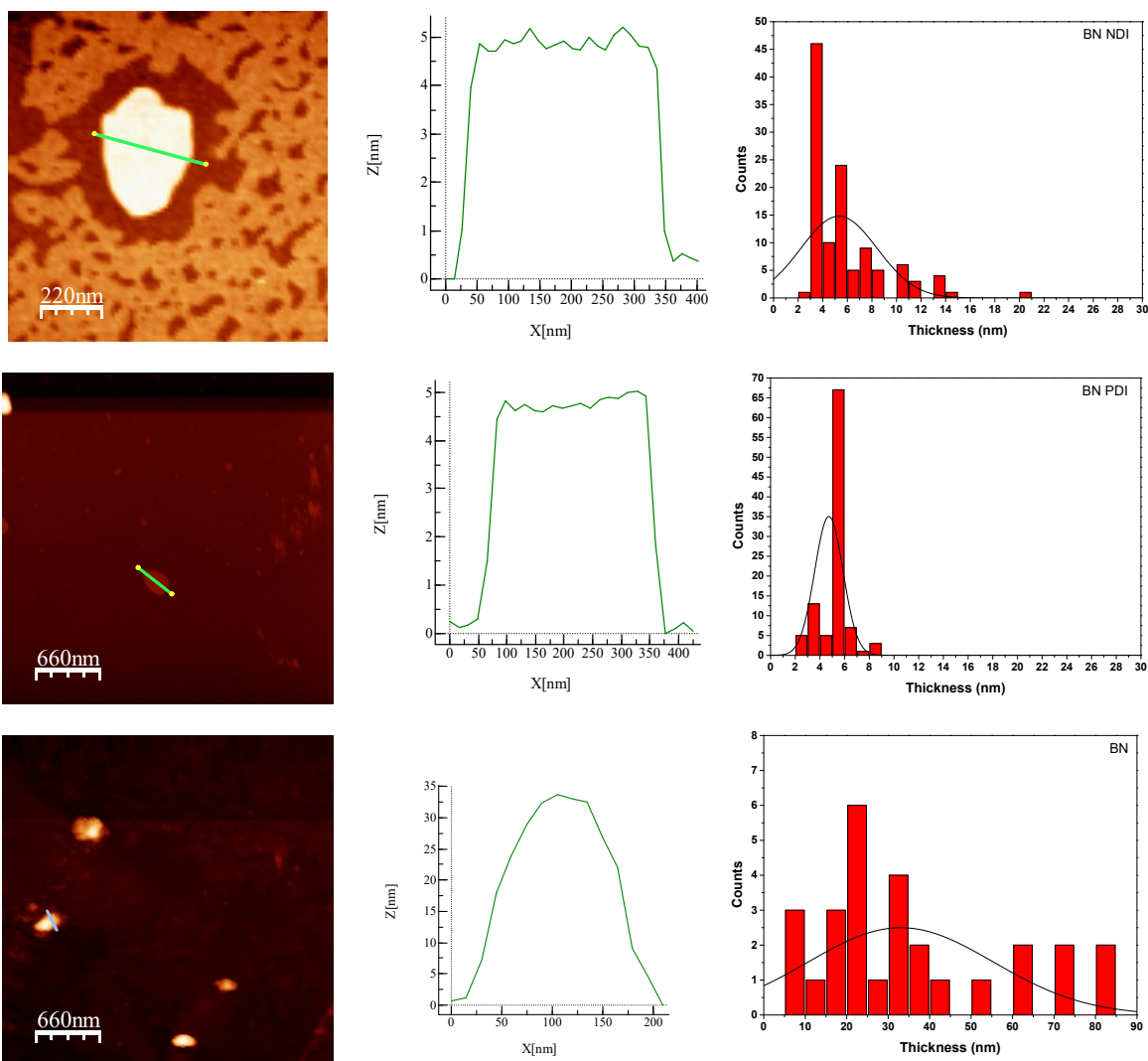
Figure S7. Exfoliation of BN. Upper part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of BN exfoliated in the presence of **C_{10}-NDI-C_{10}**. Middle part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of BN exfoliated in the presence of **C_{10}-PDI-C_{10}**. Lower part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of BN exfoliated in the absence of the aromatic cores.
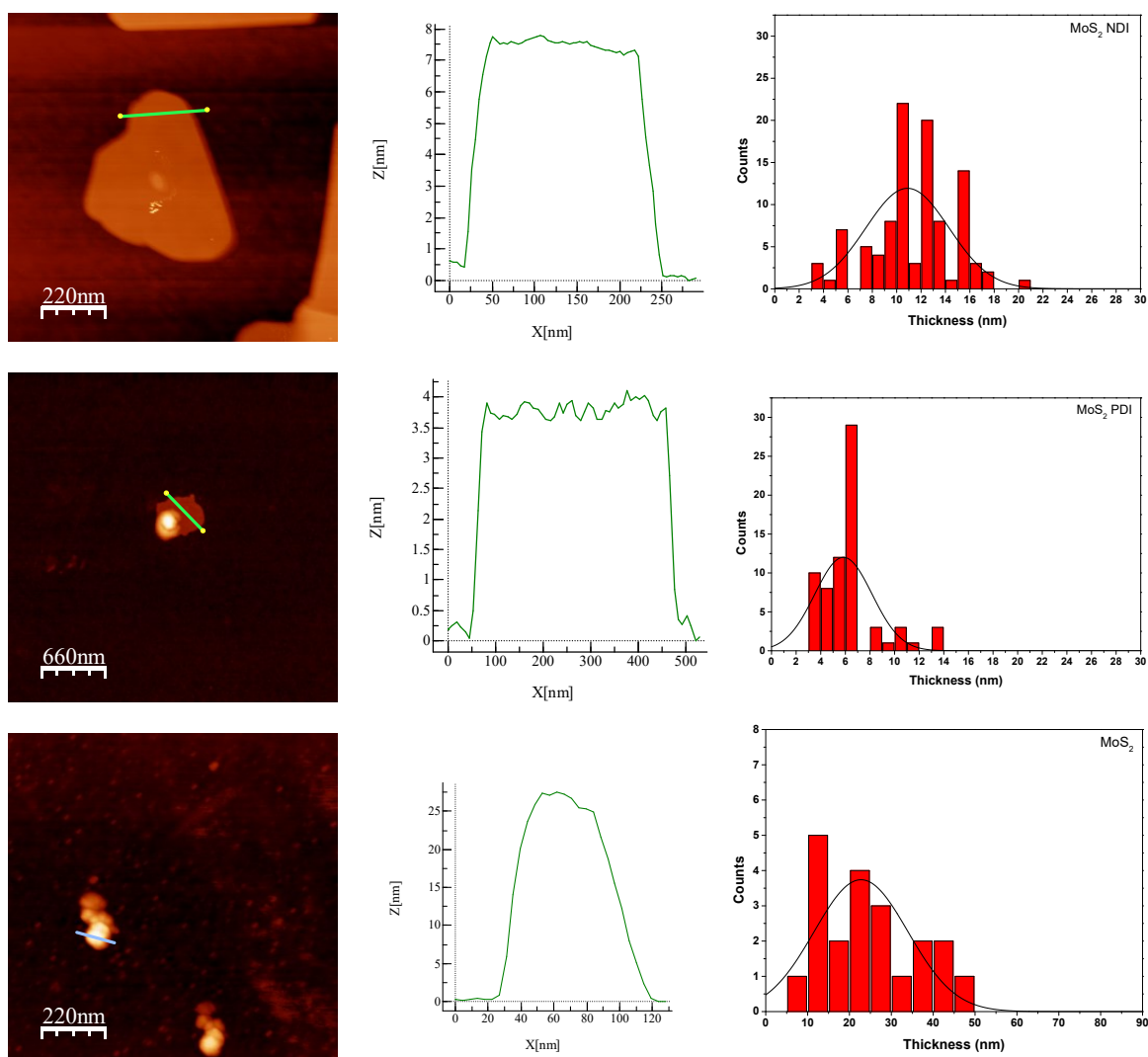
Figure S8. Exfoliation of MoS$_2$. Upper part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of MoS$_2$ exfoliated in the presence of **C$_{10}$-NDI-C$_{10}$**. Middle part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of MoS$_2$ exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$**. Lower part) Representative AFM image, corresponding height profile and statistical analysis showing the thickness of MoS$_2$ exfoliated in the absence of the aromatic cores.

The statistical analyses were performed on at least 70 sheets for each exfoliated material in the presence of the aromatic molecules. In the case of the exfoliation in the absence of the aromatic cores, the statistical analyses were performed on at least 20 sheets for each material.
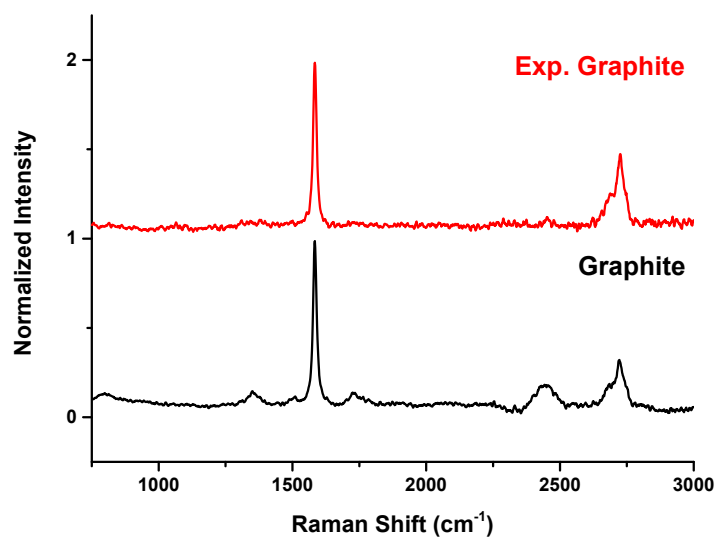
Figure S9. Average Raman spectra (λ_{exc} = 532 nm) of commercial graphite (black) and expanded graphite (red).
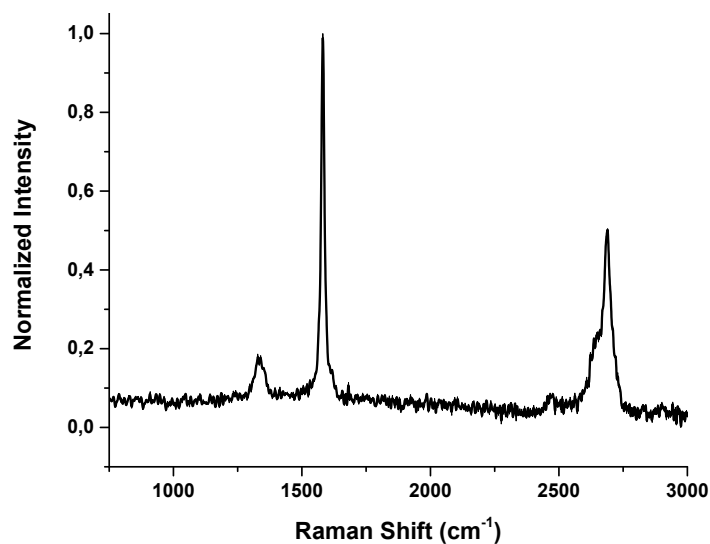

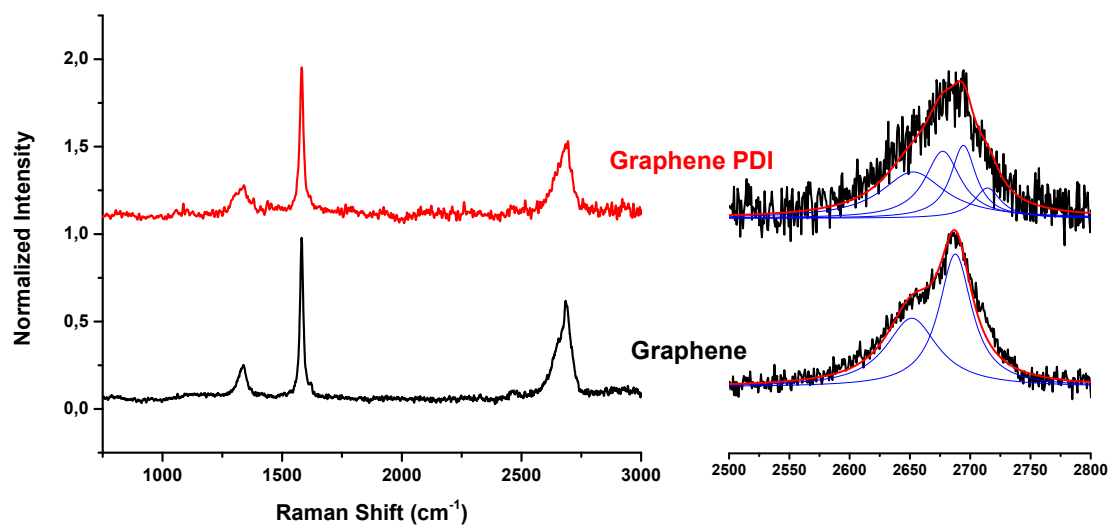**Figure S10.** Average Raman spectrum (λ_{exc} = 633 nm.) of expanded graphite.

Figure S11. Average Raman spectra (λ_{exc} = 633 nm) of graphene exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$** (red) and in its absence (black). Detailed inset of the 2D band and its deconvolution.
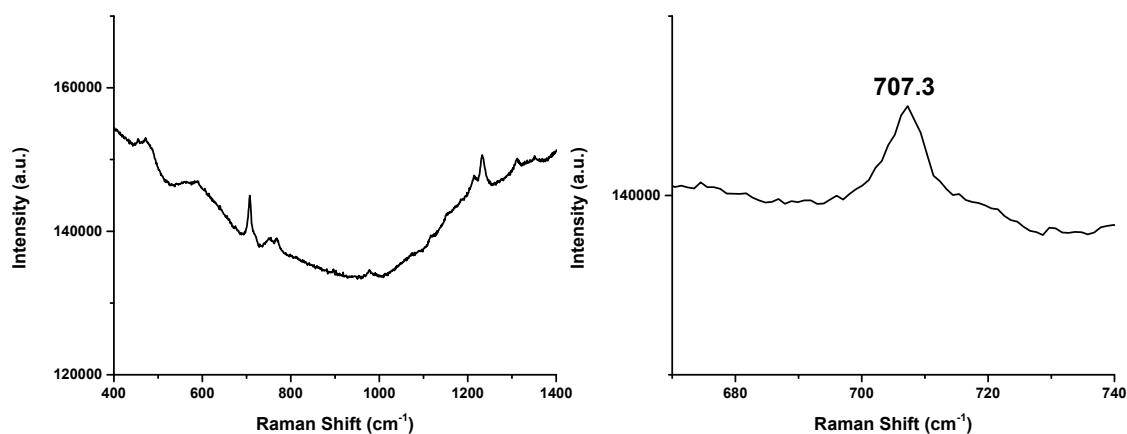
Figure S12. Average Raman spectrum (λ_{exc} = 633 nm) of bulk g-C_3N_4. Enlarged Raman spectrum of the region located between 670 and 740 cm^{-1}.

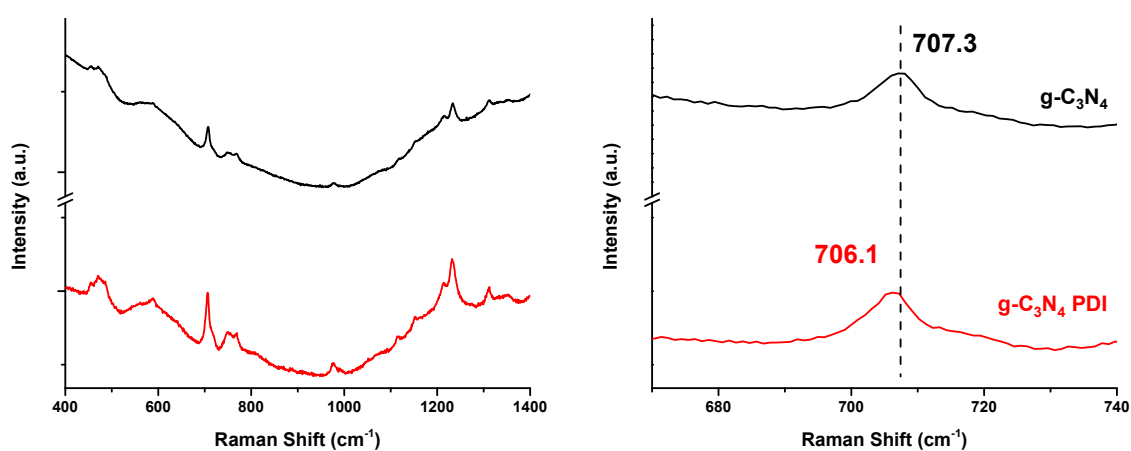**Figure S13.** Average Raman spectra (λ_{exc} = 633 nm) of g-C_3N_4 exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$** (red) and in its absence (black). Enlarged Raman spectra of the region located between 670 and 740 cm^{-1}.
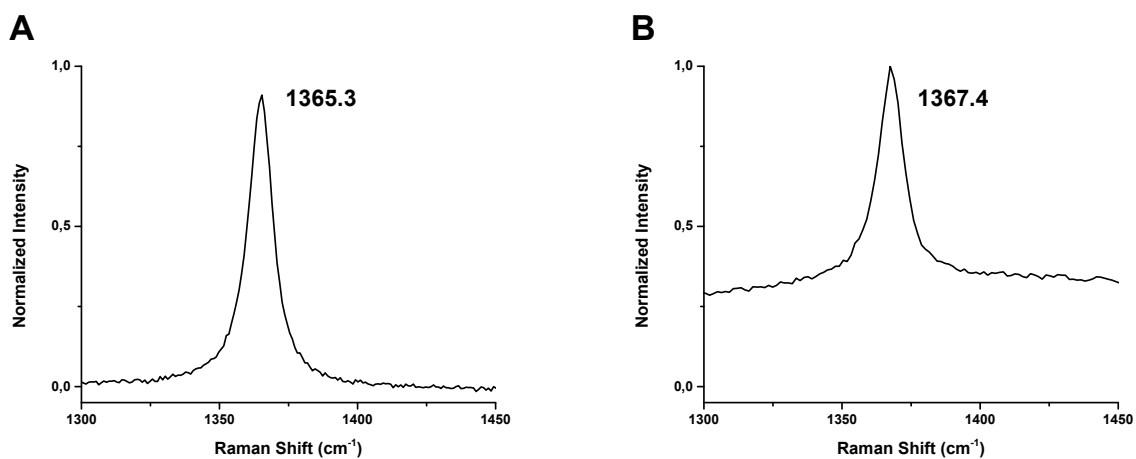

Figure S14. A) Average Raman spectrum of bulk BN (λ_{exc} = 633 nm). B) Average Raman spectrum of bulk BN (λ_{exc} = 532 nm).
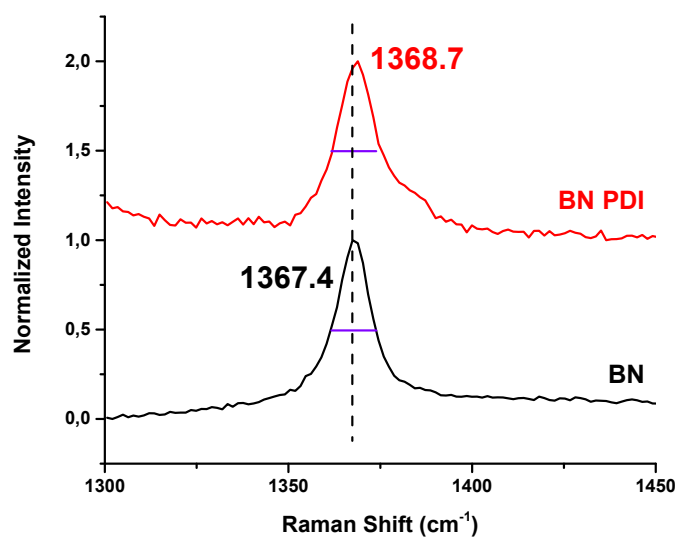
Figure S15. Average Raman spectra (λ_{exc} = 532 nm) of BN exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$** (red) and in its absence (black). In purple is marked the FWHM.
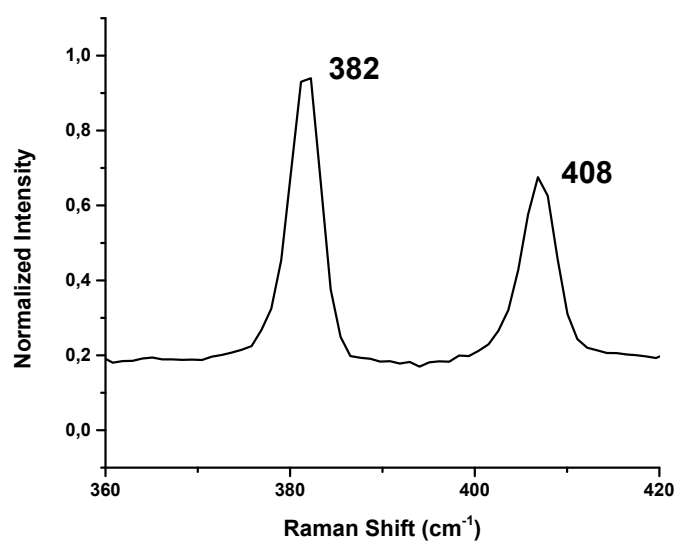

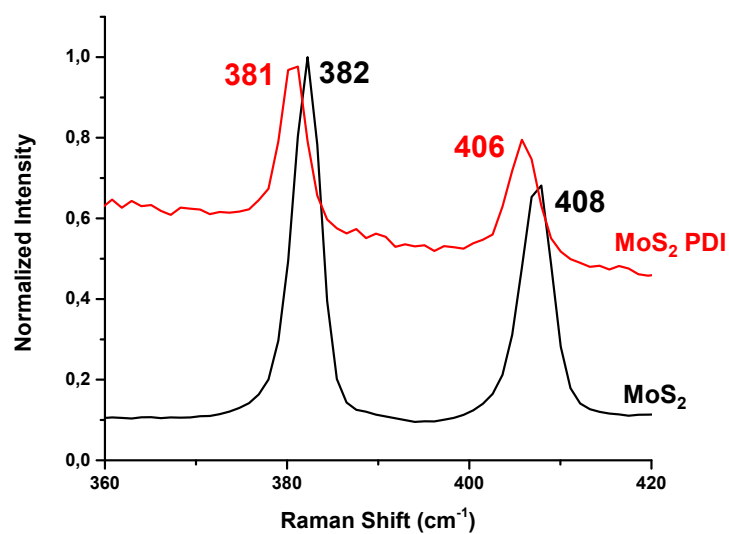**Figure S16.** Average Raman spectrum of bulk MoS$_2$ (λ_{exc} = 785 nm).

Figure S17. Average Raman spectra (λ_{exc} = 785 nm) of MoS$_2$ exfoliated in the presence of **C$_{10}$-PDI-C$_{10}$** (red) and in its absence (black).
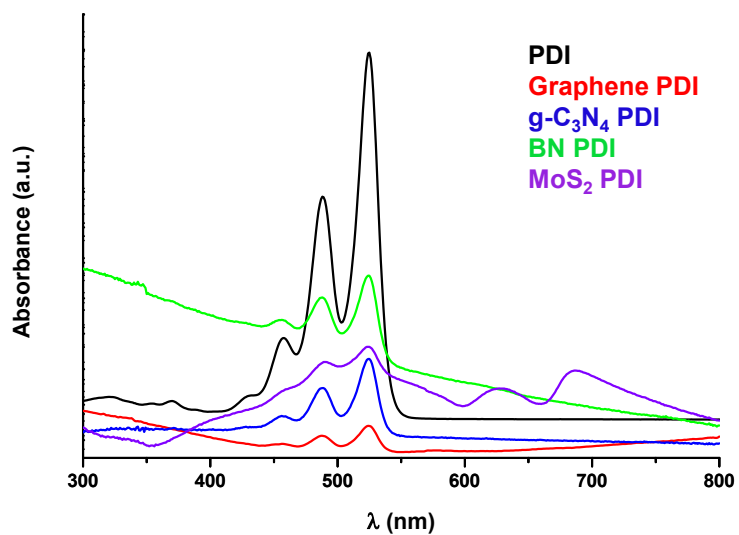
Figure S18. UV-Vis spectra in DCM of **C$_{10}$-PDI-C$_{10}$** (black), graphene PDI (red), g-C$_3$N$_4$ PDI (blue), BN PDI (green) and MoS$_2$ PDI (purple).
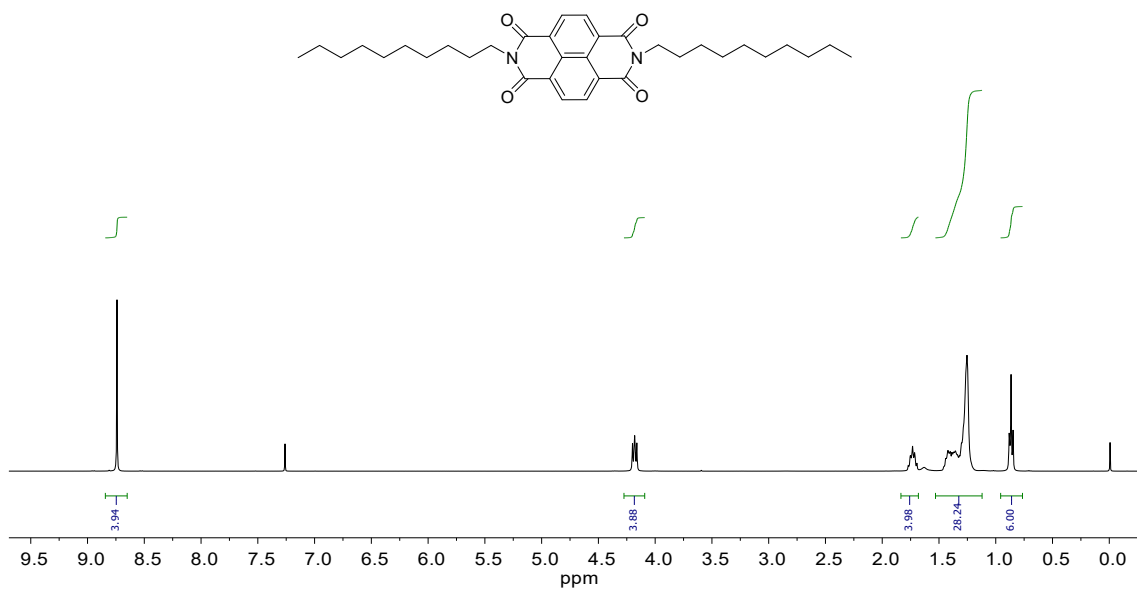
Figure S19. ^{1}H-NMR of **C$_{10}$-NDI-C$_{10}$** (400 MHz, CDCl$_3$).
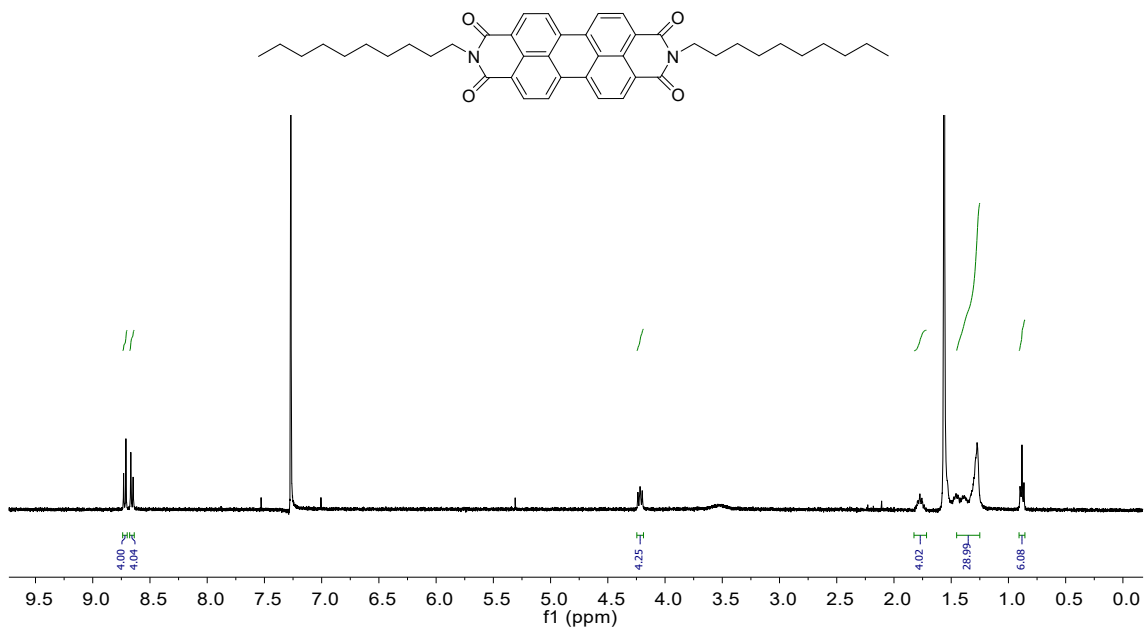
Figure S20. ^{1}H-NMR of **C$_{10}$-PDI-C$_{10}$** (400 MHz, CDCl$_3$).