Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

The distribution of fullerenes on graphene layer (before the transfer of the second graphene layer) was studied by AFM microscopy. The AFM images (Fig. S1(a,b)) show that fullerenes tend to form aggregates that are randomly distributed on the bottom graphene layer. The thin lines that link the fullerene aggregates are wrinkles on graphene. The wrinkles are known to release mechanical strain in graphene, hence they are expected to be found preferentially on places where fullerene/fullerene aggregate are present. After deposition of the top graphene layer (Fig. S1(c)), fullerenes/fullerene aggregates induce wrinkles in the top graphene layer. The characteristic size and fullerenes/fullerene aggregates and distance between them correspond to the parameteres of the wrinkles in the top graphene layer. The AFM map of graphene bilayer is shown in Fig S1(d). The fullerenes on graphene were also studied by Raman spectroscopy. The map of the Raman shift of the graphene 2D band is shown in Fig. S2. The spatial variations of the 2D position are presumably caused by differently strained areas.

Figure S3 shows raw correlation plots of local roughness obtained by AFM and of the relative G_2 peak area, strain and doping for the ^{13}C top graphene layer in 2-D fullerene peapod. Because it is very difficult to see a tendency on correlation graphs, we performed advanced analysis in which each 100 adjacent points were binned together and the median value was calculated, hence the statistics was significantly improved. The resulting dependence is shown in Figure 3 of the main text.

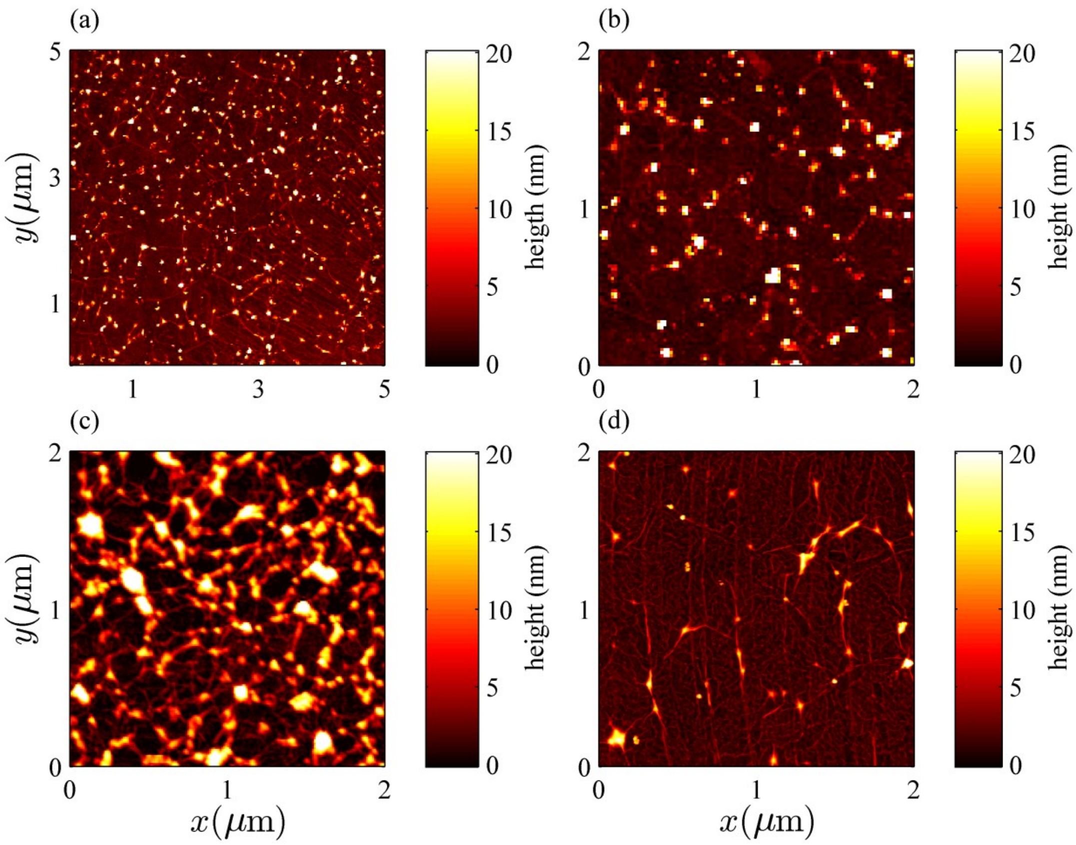

Fig. S1: The AFM image of distribution of the fullerene aggregates on the bottom graphene layer (a,b). The AFM image of 2-D peapod is shown in (c). The AFM map of an isotopically labelled graphene double layer (d).

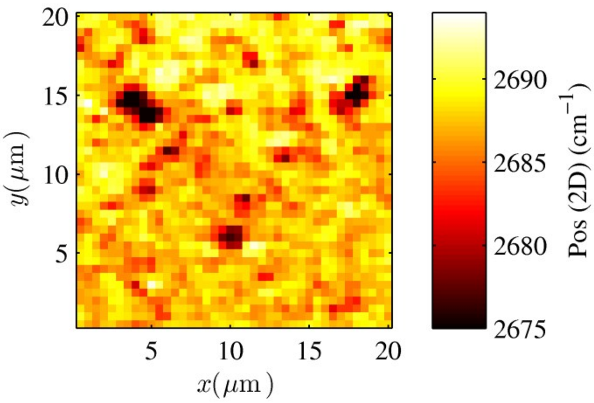

Fig. S2: The Raman map of the position of the 2D band of the bottom graphene layer, without the covering layer.

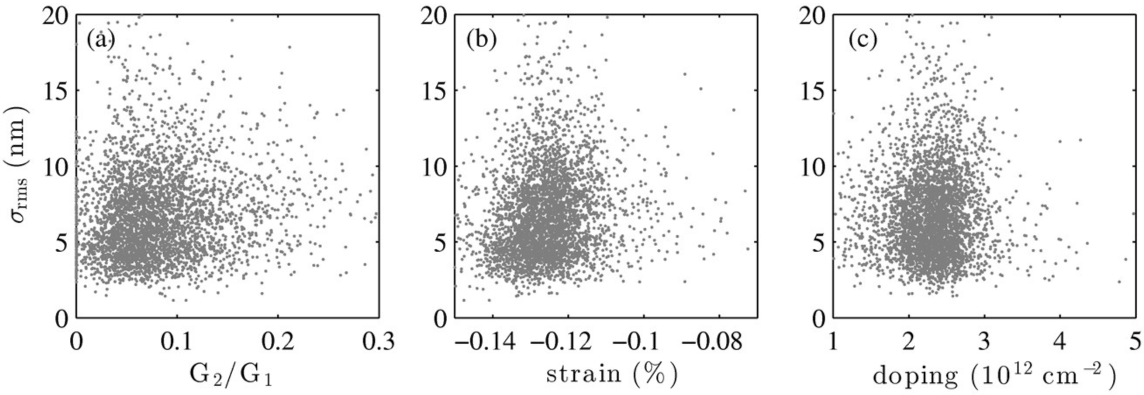

Fig. S3 A correlation plot of local roughness obtained by AFM and of the relative G_2 peak area (a), strain (b) and doping (c) of the ^{13}C top graphene layer.