**Table S4**. SBM Parameters obtained from the curve fit with all parameter values floating.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Definition** | **Oxidized Graphite** | **Graphene Nanoplatelets** | **Reduced Graphene Nanoplatelets** | **Graphene Nanoribbons** |
|  | Zero-field splitting energy (ZFS) |  |  |  |  |
|  | Manganese-Hydrogen Bond Radius |  |  |  |  |
|  | Hydration number |  |  |  |  |
|  | Tumbling time of complex |  |  |  |  |
|  | Correlation time for splitting |  |  |  |  |
|  | Residence time of inner sphere water molecules |  |  |  |  |