**Table S5**. SBM Parameters obtained from the curve fit for fixed Q=2 and remaining SBM parameters allowed to float.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Definition** | **Oxidized Graphite** | **Graphene Nanoplatelets** | **Reduced Graphene Nanoplatelets** | **Graphene Nanoribbons** |
|  | Zero-field splitting energy (ZFS) | 1.0x1018 | 1.0x1018 | 1.0x1018 | 1.0x1018 |
|  | Manganese-Hydrogen Bond Radius | 3.02x10-10 | 2.80x10-10 | 3.09x10-10 | 2.26x10-10 |
|  | Hydration number | 2 | 2 | 2 | 2 |
|  | Tumbling time of complex | 2.24x10-9 | 1.49x10-9 | 3.48x10-9 | 2.47x10-9 |
|  | Correlation time for splitting | 2.95x10-12 | 1.0x10-12 | 1.67x10-12 | 1.0x10-12 |
|  | Residence time of inner sphere water molecules | 3.40x10-8 | 3.34x10-7 | 7.93x10-9 | 1.28x10-9 |