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[21] The saturation magnetization provides information on the total amount of molecules present on the surface. Taking the contribution of each molecule to be 20 μ_B, a signal of 2×10^{-5} emu (Fig. 5a) corresponds to 1×10^{14} molecules ($1\ \mu_B = 0.928\times10^{-20}$ emu). On the other hand, assuming that the molecules occupy an area of $\pi\times(0.9)^2$ nm^2 (lying flat) our piled-up samples with a total surface of 1.2 cm^2, lead to 0.5×10^{14} molecules, which is equivalent to 2 ML. If we assume, however, that domains of standing up molecules (denser packing) are present on the surface, the saturation magnetization in Figure 5a leads to a total number of $Mn_{12}Piv_{(16-x)}$ molecules that is comprised of between 1 ML and 2 ML as expected.
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Chemical Sensors Based on Highly Conductive Poly(3,4-ethylenedioxythiophene) Nanorods**

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Conducting polymers such as polypyrrole, polyaniline, and polythiophene show interesting chemical and physical properties derived from their unique conjugated π-electron system.[1] In particular, the oxidation level of conducting polymers is readily affected by chemical or electrochemical doping/dedoping (oxidation/reduction) mechanisms, causing a sensitive and rapid response to specific chemical species.[2] These features allow conducting polymers to be utilized as versatile sensors. Conducting polymers are generally more sensitive to environmental perturbation than other sensing materials because of their inherent transport properties, such as electrical conductivity and energy migration.[3] In addition, conducting polymer nanostructures including nanorods, nanofibers, and nanotubes have a high surface area as compared to their conventional bulk counterparts. Therefore, they have the capability of offering amplified sensitivity and real-time response as a result of enhanced interaction between the conducting polymers and the analytes.[4] Despite such advantages, conducting polymer nanostructures have not been extensively used as sensor materials.[5] In particular, little research has been done so far on the development of sensor systems using poly(3,4-ethylenedioxythiophene) (PEDOT) nanostructures. PEDOT has received much attention owing to its high electrical conductivity, low bandgap, and outstanding environmental stability.[6] In this work, we report a novel reverse cylindrical micelle-mediated interfacial polymerization technique to fabricate highly conductive PEDOT nanorods. Furthermore, we utilized PEDOT nanorods as a sensing material for the detection of hydrogen chloride (HCl) and ammonia (NH_3) vapor. Ammonia, a colorless gas with a pungent and suffocating odor, is recognized as one of the primary irritants to humans, and the limit for human exposure is approximately 20 ppm.[7] Hydrogen chloride is also a colorless and corrosive gas with a pungent odor, and it can cause irritation above 5 ppm.[8] Therefore, detection of these vapors has continuously attracted interest in fields of industrial processing, clinical diagnosis, and environmental monitoring.

In order to fabricate PEDOT nanorods, iron-cation-adsorbed reverse cylindrical micelles were prepared in hexane via a coordination interaction between an aqueous $FeCl_3$ solution and sodium bis(2-ethylhexyl)sulfosuccinate (AOT).[9,10] AOT was dissolved in hexane, and then the addition of aqueous $FeCl_3$ solution generated the reverse cylindrical micelles. The formation of the AOT reverse cylindrical micelle phase could be verified from the birefringent striations observed with a polarized optical microscope. In the AOT reverse cylindrical micelle phase, the anionic head-groups of AOT extract iron cations from the aqueous $FeCl_3$ solution by an electrostatic attraction, and thus the iron cations can be adsorbed to the anionic head-groups of AOT. Iron cations act as the oxidizing agent for the chemical oxidation polymerization of the 3,4-ethylenedioxythiophene (EDOT) monomer, and AOT reverse cylindrical micelles contain water channels in their polar cores. Accordingly, one-dimensional (1D) water–oil interfaces compartmentalized by reverse cylindrical micelles were constructed, and all requisites for carrying out the interfacial polymerization were fulfilled at the nanometer scale (Scheme 1a).

In previous work,[10] the pyrrole monomer was added to the iron-cation-adsorbed AOT reverse cylindrical micelle phase. Subsequently, the chemical oxidation polymerization of the

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