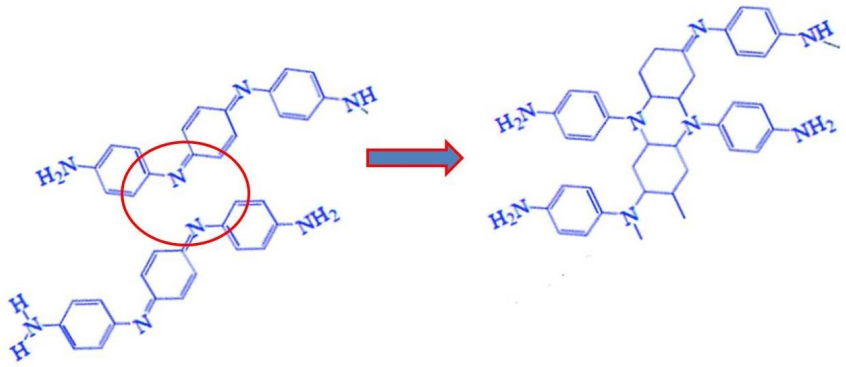
Supportive Information

The phenomenon of two-dimensional flake formation may be explained with the following quinoid cross-linking mechanism in emeraldine oxidation state of polyaniline. It is well established that when ultrasound propagates through a reactants emulsion or medium, the bubbles or cavities formation occur in the medium. The bubble and cavities formation and collapse process comprises the generation of local hot spots of very high temperatures in the reaction medium. This phenomenon subsequently results both physical and chemical effects on the reaction and growth mechanism. The generation of local hot spots and cavities formation and collapse causes fragmentation of molecules and generation of highly reactive radical species.[1] Due to this rigorous decomposition of monomers, water molecules and other oligomers present in the reaction medium, the radicals are generated which subsequently helps the polymerization process. The formation of 2D flakes like structures can be understood in two step process. I first step, the local hot spot generation and cavities formation and collapse processes prevent the growth of elongated polyaniline structures. Thus, emeraldine molecules of smaller molecular weights are formed. In second step, ultrasound helps in quinoid cross-linking process among the emeraldine molecules. However, very small amount of radicals are formed generally in the cases of inorganic emulsions, but it varies for polymeric materials.[2] The cross-linking of quinoid rings in emeraldine state of polyaniline can be realized with the help of mechanism represented in graphical figure given below-



The hypothesis of quinoid ring cross-linking also gets support from the FT-IR spectroscopy. In polyaniline samples, the peak corresponding to quinoid ring appears near 1590 cm^{-1} generally. However, in our case it can be observed that the signature peak of quinoid ring is almost absent in FT-IR curve corresponding to polyaniline in Figure 1f.

[1] B.M. Teo, S.W. Prescott, M. Ashokkumar, F. Grieser, Ultrasound initiated miniemulsion polymerization of methacrylate monomers, Ultrasonic Sonochemistry, 2008, 15, 89.

[2] G.J. Price, Recent developments in sonochemical polymerization, Ultrasonic Sonochemistry, 2003, 10, 277.

[3] Wen Ling Zhang , Bong Jun Park and Hyoung Jin Choi, Colloidal graphene oxide polyaniline nanocomposite and its electrorheology, Chem. Commun., 2010, 46, 5596.