One-pot synthesis of highly reduced graphene oxide decorated with silver nanoparticles

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Silver nanoparticles (AgNPs) decorated graphene composites are consistently some of the most frequently researched composites because they are effective in various applications, including mercury ion detection, ammonia detection, glucose sensors and hydrogen peroxide sensors. Up to date, many research involves multiple steps to synthesis those nanocomposite, which make the preparation process complex. Graphene oxide (GO) is commonly used to tailor with AgNPs as nanocomposites but GO has a very low conductivity. In order to increase its conductivity to act as device, reduction process must occur. With that, many researchers use highly toxic chemical such as hydrazine to reduce GO or increase step by reducing GO using thermal reduction method. In this work, we focus on one-pot synthesis of highly reduced GO decorated with AgNPs (rGO-AgNPs) using one simple method and non-toxic chemical reducing agent.

Herein, we synthesis rGO-AgNPs by sonochemical method of an aqueous solution containing 5mM silver ammonia complex (Ag(NH3)2OH), 0.5 g ascorbic acid and 1000 ppm GO for 15 min. UV-Vis absorption spectra as in Table 1 shows after introducing ascorbic acid, GO peak shift from 228 nm to 270 nm which indicates the GO had been reduced very high. Meanwhile, AgNPs peak shift from 396 nm to 401 nm which indicates the AgNPs getting bigger as ascorbic acid is introduced to the aqueous solution. As compared to other work, they manage to get at highest of 264 nm reduction of GO together with synthesis of AgNPs. This proves that it is possible to synthesis nanocomposite of AgNPs on rGO with high reduction in one simple method by using non-toxic chemical reducing agent. With that, it will save the time to synthesis and increase the conductivity for device fabrication towards sensor application.

Table 1: Comparison of UV-Vis absorption peak in the presence of AA.

	Chemical reducing agent	Graphene peak position	Plasmon peak position
This work	-	228 nm	396 nm
	Ascorbic acid	270 nm	401 nm
[1]	-	251 nm	396 nm
[2]	Hydrazine	260 nm	420 nm
[3]	Hydrazine	264 nm	408 nm
[4]	Ascorbic acid	238 nm	418 nm

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