Biomimetic Synthesis of Polyaniline Catalyzed by Hematine Supported on Graphitic Carbon Nitride

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Abstract

Polyaniline is a versatile intrinsic conductive polymer easy to synthesize through several chemical and electrochemical methods. However, those require further processing steps to obtain a polymer for practical applications in such fields as nanocapacitors, biosensors and many others (Fig. 1A). Enzymatic synthesis have been merge as interesting alternative to produce polyaniline and other intrinsically conductive polymers, where the only sub-product of the reaction is water, but the main drawbacks of this method is that the peroxidases used as catalyst usually lose their acti- the pH acid needed to carry out [1]. Hematin is natural compound that biomimicry the activity of the poxidases and has been used for our group and others to catalyst the synthesis of aniline. To the difference of the proxi- dases, hematin catalyst the synthesis of polyaniline at pH acid without suffer inactivation during the polyme- rization reaction [2].

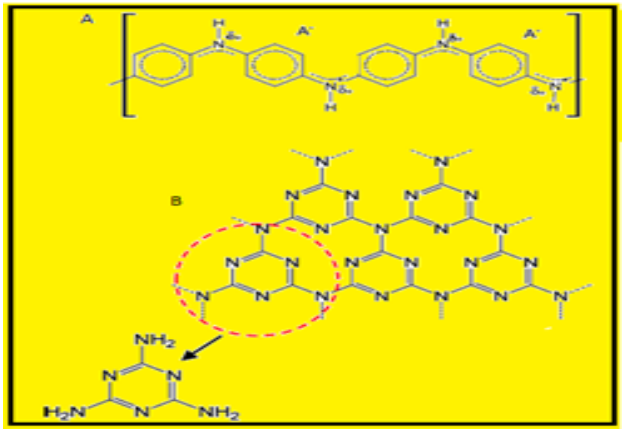

Figure 1. Schemes of the chemical structures of (A) poly aniline and (B) tris-s-triazine of gC_3N_4

In recent years, the two-dimensional materials are aroused intense scientific development due to its exceptional properties. Graphene is one of the most prominent candidates to revolutionize the industry. However other alternatives such as Carbon Graphite Nitrides have proven to be structured with a high potential in the area of photocatalysis, its application have of metallic colloids, organic catalysis and so on [3].

The so-called g-C3N4 is the most stable polymorphic analog of carbon nitride and has been the subject of great attention in the last 5-6 years (Fig. 1B). Here, we present the obtained result of the solar- thermal syn- thesis of g-C3N4 to be used as support of hematin that works like biomimetic peroxidase in the catalyst of aniline, which materials could leads to obtaining a hybrid with potential characteristics for the The syn- thesis of XRD g-C3N4 by solvothermal treatment was analyzed using X-ray diffractometry, UV-vis, FTIR, Raman, and XPS spectroscopies.The obtained results together with SEM, HR-TEM and AFM micros copies and thermal characterization are indicative of the successful synthesis of this material (Fig. 2B). The changes in absorption bands in the UV-vis spec- trum associated to the hematin after be deposited g-C3N4 layers has been explained as a complex in- teractions π-π* between this compound and the g-C3N4 layers[4]. Finally ,we found that the hematin was a high efficient ca- talyst in the polymerization of aniline as is shown in the Tem images, FTIR and UV-vis spectra (Fig. 2C).

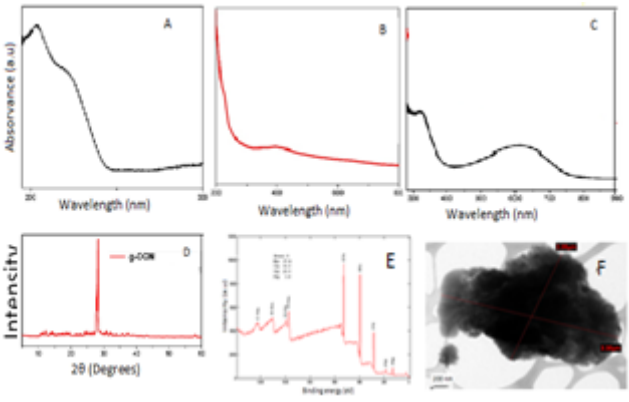

Figure 2. UV-vis spectra of (A) g-C3N4, (B) g-C_3N_4-Hematin, (C) g-C_3N_4-Hematin-Polyanilina; (E) XRD of g-C3N4 and XPS of g-C3N4

References

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