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Tuning properties of thermally reduced graphene oxide for CO_2 capture technology

Thermal exfoliation is believed to be a promising approach for the mass production of graphene that minimizes processing time. Another advantage is that the exfoliation and reduction can be achieved simultaneously without the introduction of impurities in thermal exfoliation.
CO_2 capture process represents typically about 70% of the total cost of the carbon capture and storage (CCS) chain. One of the most promising technologies for CO2 capture is based on the adsorption process using solid sorbents. As a member of this family, the metal–organic frameworks (MOFs) are well recognized for their extraordinary surface area, ultrahigh porosity, and most importantly the flexibility to tune the porous structure as well as the surface functionality. For more efficient utilization of MOFs sorbents, several hybrid systems based on MOFs with other solid sorbents have been investigated in order to utilize the synergism between the two sorbents and therefore ultimately improve the overall performance in CO_2 separation. Moreover, sorbents such as activated carbons, reduced graphene oxide (rGO) and Carbon nanotubes (CNTs) provide the added feature of high surface area and easily functionalized sites, which contribute to the tuning of the final properties of the composite material. The rGO is an important carbonaceous functional materials that has attracted considerable attention owing to its high aspect ratio, high mechanical strength, unique electrical properties, and chemical stability.
Abalonyx is a partner of a Horizon 2020 project entitled “CARMOF” in which aims to combine the advantage of physical and chemical adsorbents in a hybrid structures composed by functionalized MOFs, and rGO for CO_2 capture[1].
In this work, we present some parts of the results obtained for synthesis of rGO through thermal heat treatment. The thermal heat treatment in this work has been performed with two different strategies: in the first one, the GO samples were heated at different temperature for different soaking times. In the second approach, as reduced GO (rGO) was annealed at 800 °C and 1000 °C for 1hr under the vacuum. Indeed, the second approach combines an initial flash pyrolysis of GO at lower temperatures and a subsequent ramp-heating treatment (annealing) up to the selected final temperature (800 °C and 1000 °C). The results of characterizations obtained for annealed rGO and heat treated GO, have been compared and discussed.

References

[1] https://carmof.eu/

Figures

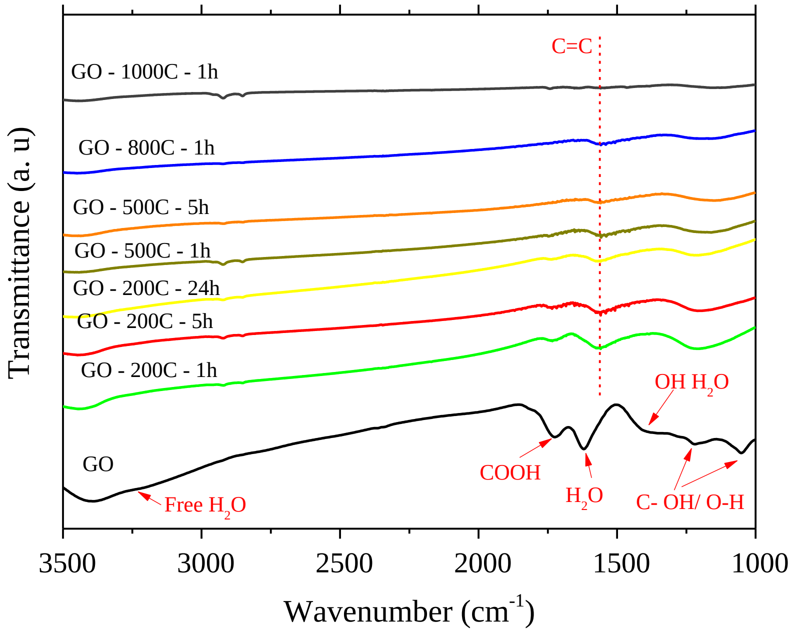

Figure 1: FTIR spectra for as received GO and heat treated GO at different conditions.

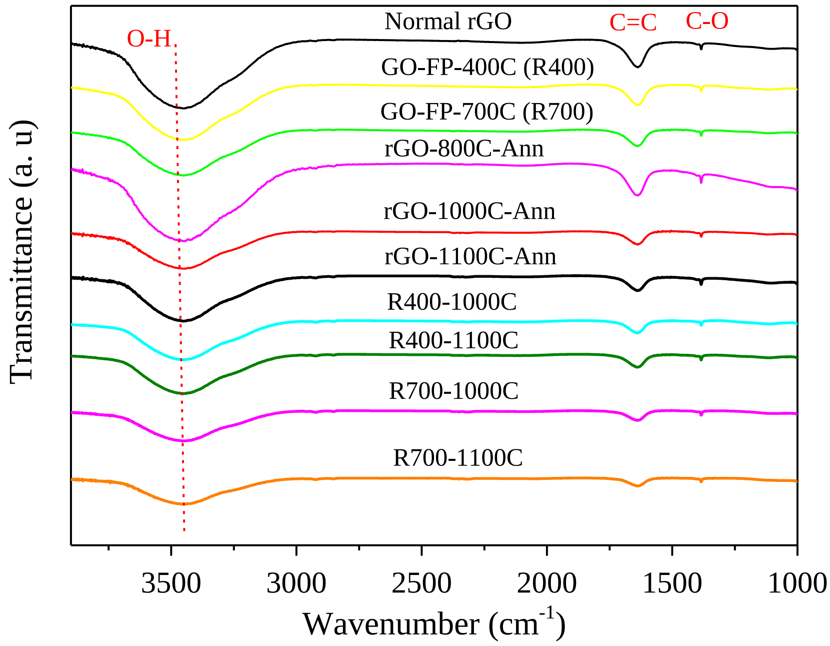

Figure 2: FTIR spectra for Normal rGO, annealed rGO at 800°C and 1000°C and Flash Pyrolysis (FP) GO at 400°C and 700°C .