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FABRICATION OF BENTONITE/ GRAPHENE OXIDE / HDTMA COMPOSITE BEADS

INTRODUCTION

Industrial wastewaters treatment is any process that separates and removes contaminants from industrial process waters, or effluents. These contaminants include oils, dissolved heavy metals, dyes, suspended solids and organic compounds.

Recently, it has been shown that the water protection of the organic coatings can be highly improved through nanoparticles. The influence of nanoclay particles modified by organo compents on the water treatment has been shown in previous study [1]. Indeed, graphene oxide (GO) adds an organic modification on the clay due to his hydrophilic and hydrophobic functional groups, It's noted that due to the electronegativity proprieties of both of graphene oxide and mineral clay, there is a weak chemical reaction between them so it's imperative to add another component to facilitate their connection such as hexadecyltrimethylammonium bromide (HDTMA-Br). This study aims to study the synergistic effects of composite using combinations of GO of high specific surface area, clay nanoparticles and surfactant HDTMA.

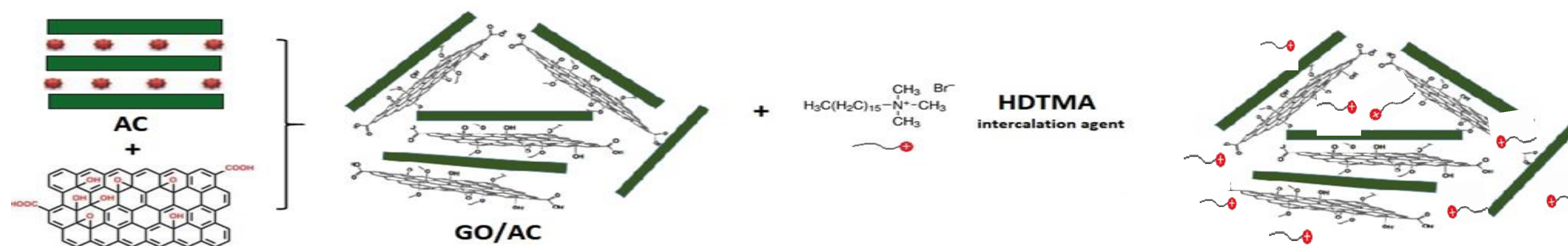


Fig.1. Synthesis and characterization of activated clay / graphene oxide / HDTMA composites

RESULTS AND DISCUSSION

X-ray diffraction (DRX)

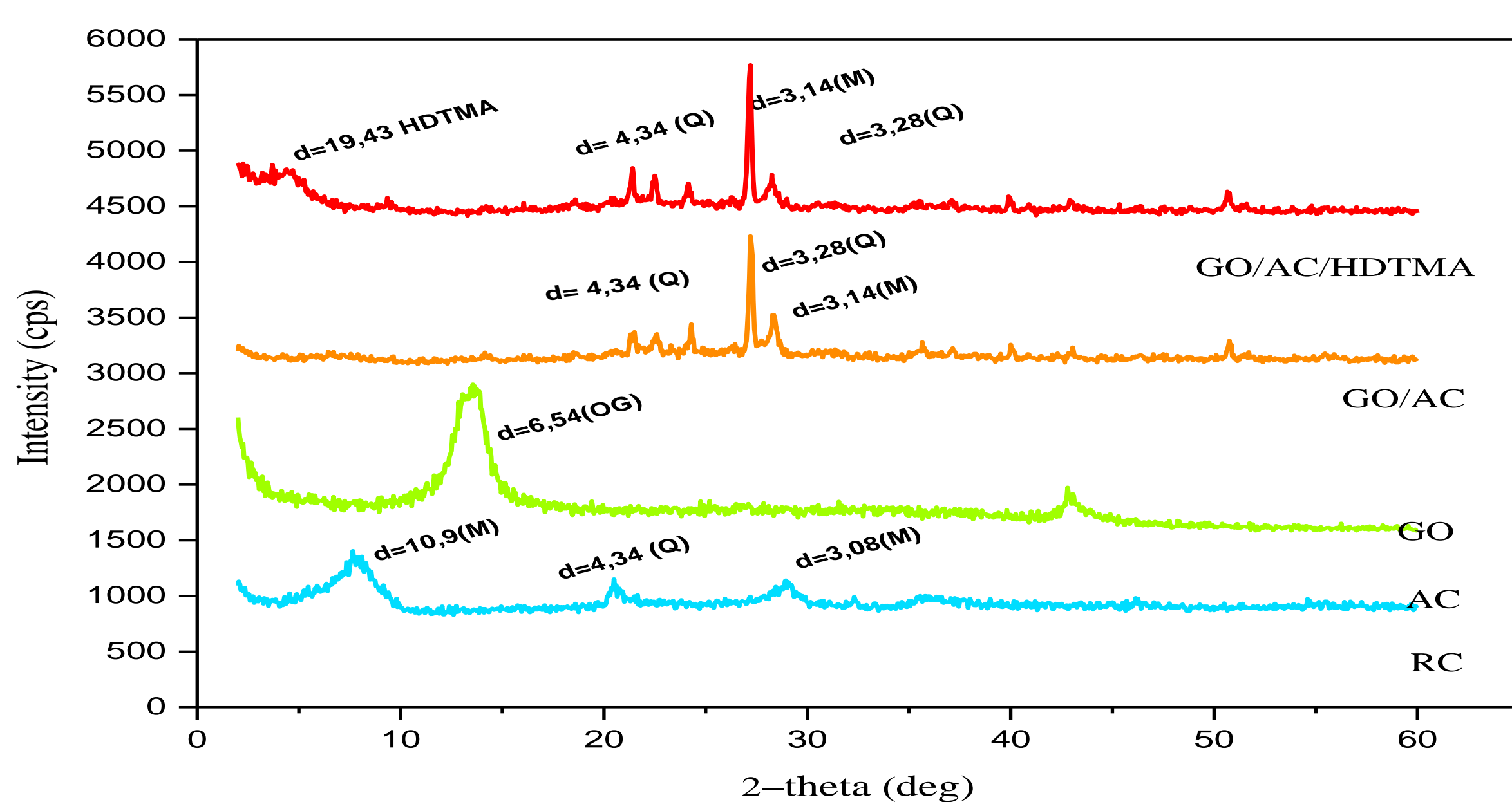


Fig.2. XRD pattern of AC, GO, GO/AC, GO/AC/HDTMA

Thermal Analysis

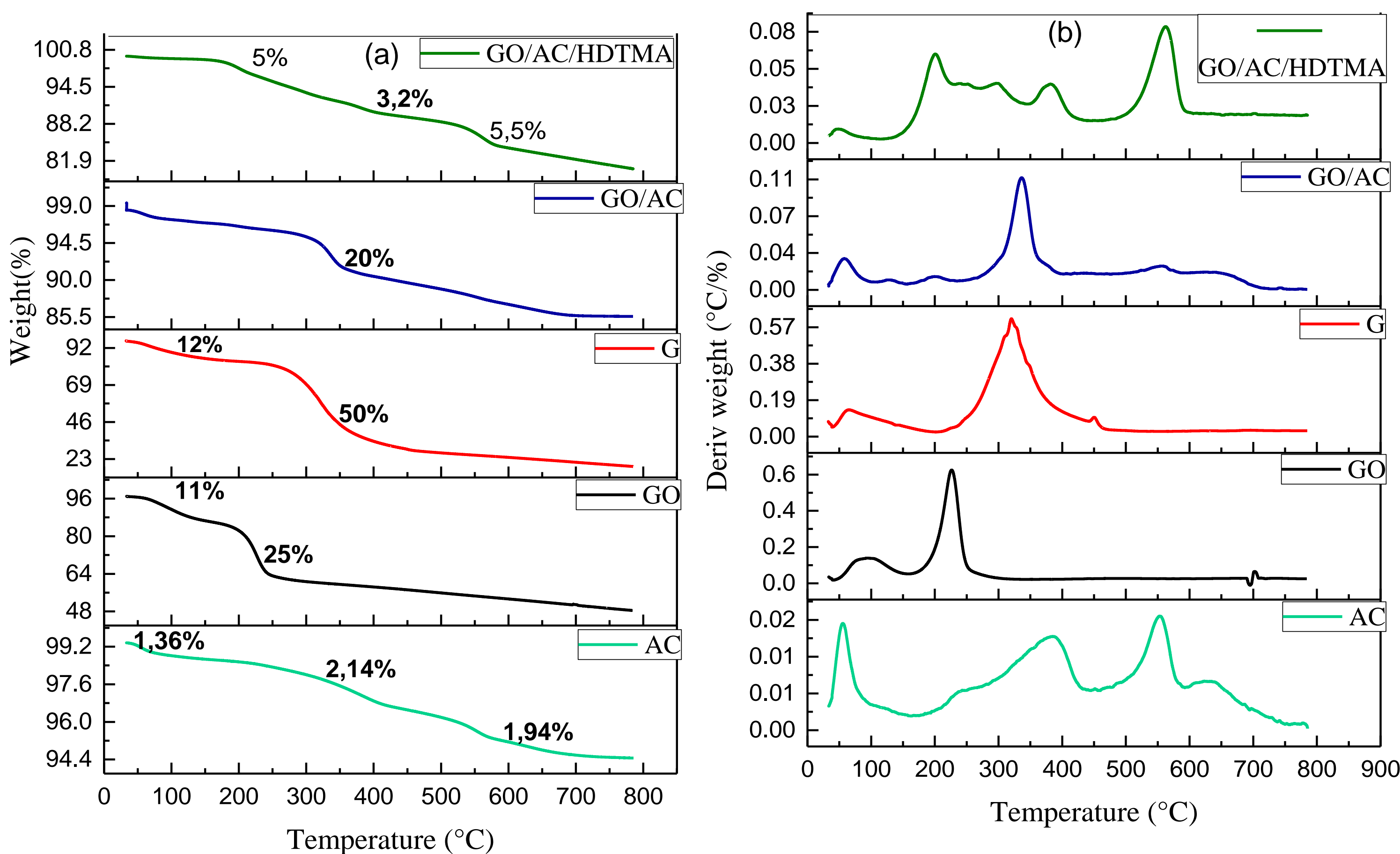


Fig.3. TG (a) and DTG (b) analysis of different components AC, GO, G, GO/AC, GO/AC/HDTMA

From the X-ray diffraction results, the activated clay (AC) we noticed the shift of montmorillonite characteristic peak from 13.68 Å to 10.9 Å in AC diffractogram. This result suggested a parallel arrangement of the clay mineral layers. No predominant GO peak was remarked on GO/AC spectrum and the disappearance of montmorillonite peak at $2\theta = 8.1^\circ$ could indicate the possibility of the formation of an exfoliated structure in the final nanocomposite [2]. The X-Ray diffraction patterns of modified clay GO/AC/HDTMA exhibited an interlayer spacing at 19.4 Å. This increase in the basal spacing for the modified clay indicates that at least a fraction of the cationic surfactant has replaced the hydrated interlayer cations [3] When HDTMA was introduced into the suspension of AC and GO, the crosslinking was formed in order to increase significantly the layer spacing of fabricated of nanocomposite material.

The TGA of AC indicated

- removal of hydrated and adsorbed water from 35 °C to 150 °C for AC
- A significant weight loss and high exothermic peak was observed in 461°C due to dehydroxylation of bentonite structure
- After that no significant weight loss was observed revealing good thermal stability.

The TGA of GO/AC exhibited

- more weight loss than AC at around 200°C to 400°C might be due to the decomposition of GO in the impregnated catalyst.

The TGA of GO/AC/HDTMA exhibited

- 50 °C was certainly attributed to adsorbed water.
- the peak observed between 120 and 230 °C corresponds to the decomposition of some cationic surfactant molecules adsorbed on the external surface of clay.
- The most important weight loss occurred between 340 and 450 °C is certainly due to the decomposition of cationic surfactants intercalated within the AC layers [4].

CONCLUSION

The results from FTIR suggested a good interaction between AC, GO and HDTMA, which results from the apparition of all characteristics peaks of AC, GO and HDTMA in the final materials. The HDTMA was used as cross-linking agent. Moreover, XRD results showed that a partially exfoliated or intercalated structure was formed. TGA analysis results proved the thermal stability of the composite GO/AC/HDTMA.

The applications of this composite in wastewater treatment to remove anionic and cationic dyes, heavy metal ions and refractory organic contaminants are expected to be a great breakthrough in future.

REFERENCES

- [1] V.S., Ashtekar V.S., et al, Dye wastewater treatment: removal of reactive dyes using inorganic and organic coagulants, Journal of industrial pollution control; **2013**, 30, 33-42
- [2] Sari, M.; Ganjaee Sari; M., Shamshiri; B., Ramezanzadeh, Fabricating an epoxy composite coating with enhanced corrosion resistance through impregnation of functionalized graphene oxide-co-montmorillonite Nanoplatelet. Corros. Sci. **2017**, 129, 38-53.
- [3] M, Naranjo .; J, Molina et al, Synthesis and characterization of HDTMA-organoclays: Insights into their structural properties. Quim. Nova. **2015**, 38 , 166-171.
- [4] M, Majdan.; S, Pikus.; A, Gajowiak.; D, Sternik.;E, Zieba., Uranium sorption on bentonite modified by octadecyltrimethylammonium bromide. J. Hazard. Mater. **2010**, 184, 662-670