Magnetic nanocomposites based on crosslinked PVA and Fe_2O_3 nanoparticles

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Organic-inorganic nanocomposites with magnetic properties based on a polymeric matrix have focused many investigations due to its potential applicability in water treatment, biomedicine and catalysts, among others [1-3]. In addition, the increased concern about the environment has led researchers to work with materials that are more sustainable, such as, poly(vinyl alcohol) (PVA), which is a biocompatible, biodegradable, water soluble and good film forming synthetic polymer [4, 5].

In this work, nanocomposites based on PVA and maghemite nanoparticles were prepared. PVA films were crosslinked with citric acid (CA), a non-toxic carboxylic acid that provide films with good mechanical properties and thermal stability. However, CA not only works as a crosslinking agent, but as a dispersant. This double role of CA, leads to interesting results, as nanoparticle addition not only endow the new material with magnetic properties, also the crosslinking is affected. In order to analyse this behaviour, nanocomposites were prepared with different nanoparticle amounts. Different characterization techniques were used to analyse the crosslinking of the films, morphology, dispersion level of nanoparticles, and the properties of nanocomposites.

As an example, In Figure 1 swelling test results and ZFC/FC measurements can be observed. Swelling test results show that until 4 wt% crosslinking is not affected by nanoparticles, but at 8 wt% the crosslinking is highly affected. From ZFC/FC measurements demonstrate that from 2 to 8 wt% of nanoparticles, nanocomposites have superparamagnetic behaviour, while 1NP-PVAxCA nanocomposite have a paramagnetic contribution that possibly hinders the superparamagnetic effect.

References

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Figures

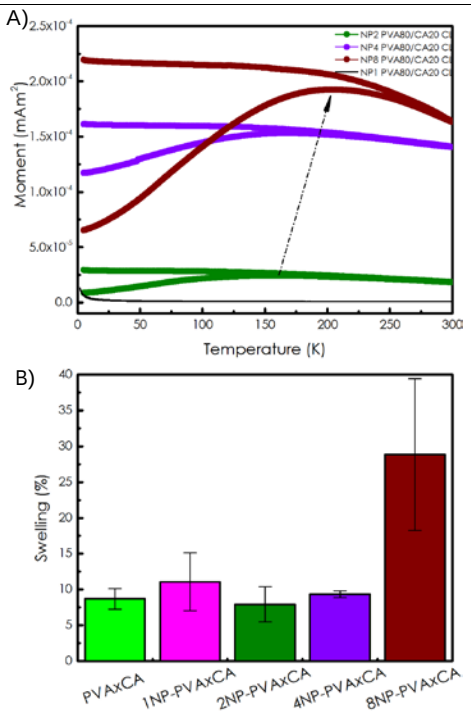

Figure 1: A) Swelling test results of crosslinked PVA and nanocomposites, B) ZFC/FC measurements of nanocomposites