Effect of temperature reactor in the clays gas-phase modification with silanes

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Abstract
It is well known that the incorporation of nanoclays into polymeric matrices improves their mechanical, thermal and barrier properties. However, it is essential to functionalise the surface of the nanoparticles to achieve optimal blending. In this sense, BIONANOPOLYS [1] is a project that joins European experts in the field of bio-based nanoscale materials which scope is not only the development of novel functionalisation methods, but also to upgrade the pilot plants dedicated to the modification of nanoparticles according to the applications defined by industry specifications. Therefore, this research aims to study the modification of commercially available montmorillonite (MMT) and layered double hydroxides (LDH) with 3-aminopropyltriethoxysilane (APTES) and tetraethyl orthosilicate (TEOS) in gas-phase.
In the experiments, a certain amount of MMT and LDH are introduced into each of the porcelain vessels, while either TEOS or APTES are placed in the bubbler and heated to a given temperature. Argon is then introduced into the bubbler, allowing the modifier to be fed into the quartz reactor where the reaction takes place. To analyse the effect of reactor temperature in the modified clays, the previous process is carried out at four different temperatures. The obtained nanomaterials are characterised by means of TGA, FTIR, XRD, and laser diffraction techniques.
The results obtained show that it is attainable to modify the surface of clays by treatment with silanes in gas-phase. By controlling the temperature, it is possible to tune up the degree of surface functionalisation, making feasible to change the hydrophobicity of the materials, improving the interaction between the nanoclays and the polymeric matrix.
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References

[1] BIONANOPOLYS Web page (2022). www.bionanopolys.eu

Figures

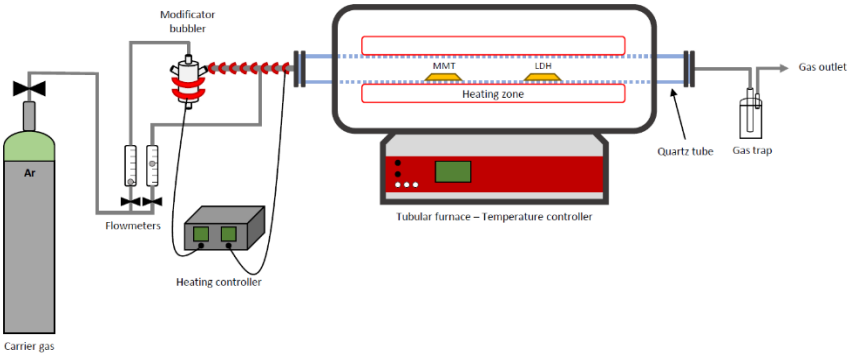

Figure 1: Scheme of tubular furnace experimental situation

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