MODIFICATION OF THE SURFACE OF SPHERICAL ALUMINOSILICATES WITH GRAPHENE OXIDE

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Introduction

The research is aimed at producing a new type of filler for composites based on spherical aluminosilicates. The aluminosilicate microspheres were subjected to the silanization process (APTES) and then doped with graphene oxide.

Materials and Methods

Spherical aluminosilicates (50 g) were etched in Caro acid (3:1 v/v), then the silanization process was propanol with APTES (10:1 v/v) for 12 h. The samples were filtered and dried at 80°C/24 h. Graphene oxide (25 g) was dispersed in 250 ml of HNO_3/H_2SO_4 mixture (3:1 v/v) for 30 min using ultrasound. The mixture was heated to 50°C for 30 min with constant stirring, the mixture was allowed to cool to room temperature. Before filtration, the mixture was neutralized to pH 7 in order to remove acid residues. Then the microspheres were filtered and dried in 100°C/24 h. The samples were calcined at 350°C, 450°C and 550°C/1,5 h in air [1,2].
Thermogravimetric analysis (TGA) with a heating rate of 10ºC/min (40ºC-1000ºC), scanning electron microscopy analysis (SEM-EDS), X-ray diffraction (XRD) and (FTIR) spectroscopy were used for the tests.

Results and Discussion

In this study, the aluminosilicate microspheres were surface modified in order to develop the surface by using the silanization process and doping with graphene oxide.
FTIR analysis showed -COOH and -OH groups, additionally nitrogen groups were detected, which may improve the chemical connection with the matrix of the composite. The shown groups may become a drug carrier in the further modification of the composite. X-ray analysis revealed peaks typical of cenospheres containing mainly aluminum silicate phases such as mullite and silimanite and other smaller phases such as quartz. The analysis showed several characteristic peaks related to the occurrence of disordered carbon structures. The structure of the microspheres in the SEM study showed surface development due to the use of the etching process and the silanization process.

Conclusions

The conducted research proved that the functionalisation of the surface of spherical aluminosilicate microspheres was right. Composites with the use of the produced filler may show lower density without losing mechanical properties, in addition, the use of graphene oxide as a drug carrier will help in the prevention of inflammation.

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