

# ONE-STEP PREPARATION OF SiO<sub>2</sub>/PLGA HYBRID MATERIAL AND STUDY ITS STRUCTURE

*Kyshkarova V. V., Vaclavikova M., Melnyk I. V.*

Institute of Geotechnics, Slovak Academy of Sciences, Košice, Slovakia

kyshkarova@saske.sk

The synthesis of organic-inorganic hybrid materials using sol-gel process has been widely investigated. They are prepared through the reaction of hydrolytic polycondensation between metal alkoxides and organic-containing precursors. One of the approaches could be the development of the hybrid material is based on their incorporation of oligomers and polymers species into the inorganic matrix constituted primarily by  $\equiv\text{Si-O-Si}\equiv$ . Such materials can show not only combined properties of organic and inorganic components but also synergistic features due to hybridization at the nanometer level.

In this study as inorganic precursor was used tetraethyl orthosilicate (TEOS), as an organic polymer – PLGA, a copolymer of poly lactic acid (PLA) and poly glycolic acid (PGA). PLGA is normally an acronym for poly D,L-lactic-co-glycolic acid where D- and L-lactic acid forms are in equal ratio. PLGA polymer exhibits excellent biocompatibility, long-standing track record, and properties for continuous drug release, it is widely used in biomedical field.

The synthesis was carried out in acetone due to PLGA solubility. Firstly, TEOS was hydrolysed with HCl catalyst, and then oligomer of organic polymers (PLGA) was added. To start condensation reaction sodium fluoride was used. After 24h a gel was formed, after that, it was crushed, washed and dried in oven at 100 °C.

The composition of the hybrid material was considered by elemental analysis, acid-base titration, electrokinetic potential measuring, and IR spectroscopy. All these methods confirmed the presents of acid groups, their content 3.4 mmol/g, the isoelectric point value is at pH = 2.23. IR spectroscopy confirmed the presence of the characteristic absorption bands for PLGA and silica (Fig. 1), as well as  $\equiv\text{SiO-R}$  which may mean co-condensation between the two components in such hybrid. The size of the obtained particles according to photon cross-correlation spectroscopy is about 307 nm, specific surface area is 15 m<sup>2</sup>/g, so this material is non-porous.

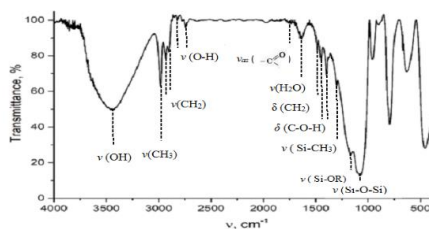


Fig. 1. IR spectrum of SiO<sub>2</sub>/PLGA material

Thereby, a one-stage method of synthesis of new hybrid material with acidic groups was developed, its application will be further explored.

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