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Advanced composites based on silicate - organic nano-structured binders

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The work describes the properties of soluble, organic silicates and their applications to obtaining nanocomposite materials. We analyzed the properties of the water-soluble high-modulus silicate systems, and their technology for producing. The aim of this paper is the comparison properties of binders based on liquid glass containing strong organic bases silicates. We have shown how these systems are transformed, from lower to higher oligomers, through the formation of the silica sol and the implementation of the sol-gel process for these oligomers. We have conducted advanced research of various aspects of the use of these materials as the binder. Advantages of strong organic bases silicates in the preparation of heat resistant, nanocomposite materials are shown. Ways to obtaining quaternary ammonium silicates and their use to produce nanocomposites are proposed. Products obtained in this way can be used as a binder in the preparation of nanostructured composite materials, water-based paints, coatings, etc. Modifiers have been proposed for making of hybrid nanostructured composite materials by a sol-gel process and have been shown of structuring some phenomena aspects, synthesis and application of hybrid materials based on silica with grafted polymers. It has been shown, the possibility of modifying compositions using the nanostructuring agents such as tetrafurfuryloxysilane. In the present work are also described methods of synthesis products for modifying a sol-gel process using polyurethanes. This paper also describes methods for the synthesis of products for modifying a sol-gel process using organic soluble silicates. We are displaying their use for the production of new nanocomposite materials and coatings for protection against various external factors.

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Poly(vinylidene-trifluoroethylene)/barium titanate composite for healing of bone detects of osteoporotic-like rats

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The guided bone regeneration (GBR) technique has been successfully employed in the periodontal therapy and maxillofacial surgery. On the other hand, osteoporosis is the most common metabolic disease of the bone that affects manly postmenopausal women. This disease is characterized by a reduction in bone mass, reduction of bone density and deterioration of architectural of the bone tissue. Considering the low potential for bone regeneration in host osteoroporic bone the use of allograft biomaterials to promote bone healing can be useful in the treatment of periodontal disease. The aim of this study was to evaluate the bone formation according to the GBR principle using a PVDF-TrFE/$BaTiO_3$ placed on calvarial bone defects of osteoporotic-like rats. For this, Wistar rats weighting 250–300 g were anesthetized for the induction of osteoporosis-like conditions, by ovariectomy. Calvarial defect with 5-mm diameter was created, and sterilized membranes of P(VDF-TrFE)/$BaTiO_3$ (TB group) and commercial membranes of e-PTFE (PTFE group) were randomly placed on the bone critical defects of all animals. Both bone volume and bone surface were not affected by the type of membrane employed (e-PTFE or P(VDF-TrFE)/$BaTiO_3$), however bone volume and bone surface are significantly larger on the animals that received the membrane of P(VDF-TrFE)/$BaTiO_3$ and e-PTFE ($p<0.05$). Hierarchical analysis of variance showed that the groups OV (osteoporotic rats) and CT (control group, non ovariectomized rats) are similar regarding the parameters bone volume and bone surface.

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