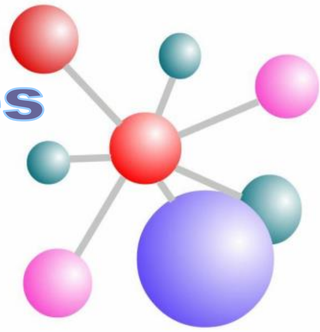
UFRN UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE

Exame de Proficiência 2015.2

Inglês



Engenharias

Instruções

1	Confira se os dados contidos na parte inferior desta capa estão corretos e, em seguida, assine no espaço reservado para isso. Se, em qualquer outro local deste Caderno, você assinar, rubricar, escrever mensagem, etc., será excluído do Exame.
2	Este Caderno contém 5 questões discursivas referentes à Prova da Língua Estrangeira escolhida pelo candidato. Não destaque nenhuma folha.
3	Se o Caderno estiver incompleto ou contiver imperfeição gráfica que impeça a leitura, solicite imediatamente ao Fiscal que o substitua.
4	Será avaliado apenas o que estiver escrito no espaço reservado para cada resposta, razão por que os rascunhos não serão considerados.
5	Escreva de modo legível, pois dúvida gerada por grafia, sinal ou rasura implicará redução de pontos.
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7	Use exclusivamente caneta esferográfica, confeccionada em material transparente, de tinta preta ou azul. Em nenhuma hipótese se avaliará resposta escrita com grafite.
8	Utilize para rascunhos, o verso de cada página deste Caderno.
9	Você dispõe de, no máximo, três horas, para responder as 5 questões que constituem a Prova.
10	Antes de retirar-se definitivamente da sala, devolva ao Fiscal este Caderno.

Assinatura do Candidato: ____

COMPERVE UNIVERSIDADE FEDERAL DO RIO GRANDE DO NORTE

As questões de 01 a 05, cujas respostas deverão ser redigidas EM PORTUGUÊS, referem-se ao texto abaixo.

Waste Cellulose from Tetra Pak Packages as Reinforcement of Cement Concrete

G. Barrera, C. E. Díaz, E. Yañez, V. Guerrero, E. Santiago, L. Córdoba, and M.M. López

The development of the packaging industry has promoted indiscriminately the use of disposable packing as Tetra Pak, which after a very short useful life turns into garbage, helping to spoil the environment. One of the known processes that can be used for achievement of the compatibility between waste materials and the environment is the gamma radiation, which had proved to be a good tool for modification of physicochemical properties of materials. The aim of this work is to study the effects of waste cellulose from Tetra Pak packing and gamma radiation on the mechanical properties of cement concrete. Concrete specimens were elaborated with waste cellulose at concentrations of 3, 5, and 7 wt% and irradiated at 200, 250, and 300 kGy of gamma dose. The results show highest improvement on the mechanical properties for concrete with 3 wt% of waste cellulose and irradiated at 300 kGy; such improvements were related with the surface morphology of fracture zones of cement concrete observed by SEM microscopy.

Introduction

Due to the increment of awareness on environment, the use of waste materials is an attractive area of opportunity. Solid wastes are classified by their chemical nature as organic and inorganic; recovery of them has been under study for a long time. Use of waste in building materials, road construction, and pavement are beneficial because it reduces environmental pollution and solves the waste disposal problems. Such waste materials should show an effective recycling or reuse. Several improvements have been reported for incorporating waste of recycled polymers, for example, in the case of asphalt pavement or in road performances.

Among waste materials are those containing cellulose as Tetra Pak packages; such packing is made up of three raw materials: paper (about 75%), low density polyethylene (about 20%), and aluminum (about 5%). Aseptic packages are recycled through a simple, well-established process called hydropulping. In this process, the cellulosic fibers are separated from thin layers of polyethylene and aluminum. Early study on Tetra Pak garbage showed recovery of their components, being cardboard 63 wt%, polyethylene 30 wt%, and aluminum 7 wt%.

Degradation of cellulose or lingo cellulosic materials produced a huge number of water soluble or insoluble oxygenated compounds. The water content of aqueous phases is high, and it contains some valuable chemicals; one of them is phenolic compounds. It is convenient to mention that high-quality cellulosic fibers are used in the production of paper products such as tissue and paper towels and fine writing paper.

Some investigations are concerned with the use of cellulosic materials as fillers in composite materials. Most of the waste from the paper industry is known as paper sludge (PS) which is burnt and becomes PS ash. This is used as a soil improvement material and cement raw material. PS ash increased the strength of extremely stiff concrete; moreover, it has high water absorption. Different composite materials have been produced by incorporating cellulosic materials for improvement of mechanical properties: (a) bending behavior is improved by incorporating cellulose fibers from waste paper; (b) toughness and tensile behavior of thin-sheet cement products are improved by adding fibers of recycled waste paper; (c) shore hardness (SH) values are increased as the resin concentration increases in composites elaborated with Tetra Pak and resin materials; and (d) maximum of strengthening is achieved for cement matrixes when adding plant-fibers and man-made cellulose fibers (from 8 to 10 wt%); the costs are reduced with this substitution.

The mechanical improvements when using cellulose fibers are due mainly to their mechanical properties that include a modulus of elasticity up to 40 GPa. Moreover, fibers can be further subdivided by hydrolysis followed by mechanical disintegration into microfibrils with an elastic modulus up to 70 GPa. Such fibers are produced commercially by the pulp and paper industry.

With the exception of cotton, the main components of natural fibers are cellulose, hemicellulose and lignin, and, in minor concentration pectin, waxes and water soluble substances. Linear cellulose molecules are linked laterally by hydrogen bonds to form linear bundles, giving rise to a crystalline structure. The degree of crystallinity of cellulose is one of the most important structural parameters; the rigidity of cellulose fibers increases, but flexibility decreases with increasing ratio of crystalline to amorphous regions. Therefore, the crystalline structure of cellulose is one important parameter for evaluating the physical and mechanical properties .

Fonte: Advances in Materials Science and Engineering, 2015

Questão 1

Qual o objeto de estudo do artigo *Waste Cellulose from Tetra Pak Packages as Reinforcement of Cement Concrete*?

Espaço para Resposta

Questão 2

Quais são os benefícios do uso de materiais oriundos de rejeitos na área de engenharia?

Espaço para Resposta

Questão 3

Explique, de acordo com o texto, o interesse na investigação do uso de materiais celulósicos, como enchimento, na preparação de compósitos.

Espaço para Resposta

Questão 4

A que se deve a otimização mecânica, quando fibras de celulose são usadas?

Espaço para Resposta

Questão 5

- Traduza o fragmento textual abaixo no espaço reservado para isso.
- Seu texto deverá apresentar clareza e estar bem articulado tanto em termos estruturais quanto de sentido.

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