J Material Sci Eng 2013, 2:4
http://dx.doi.org/10.4172/2169-0022.S1.012

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Materials Science & Engineering

October 07-09, 2013 Hampton Inn Tropicana, Las Vegas, NV, USA

Hydration, mechanical properties and microstructure of Portland cement substituted by a combination of metakaolin and nano-clay

Jianqiang Wei and Christian Meyer
Columbia University, USA

Using natural fibers like sisal fiber in fiber reinforced cement composites is being considered because of the various benefits in regard to sustainable development. However, such organic materials are subject to degradation caused by reacting with the alkaline pore solution. A possible remedy is the combined substitution of metakaoline (MK) and nanoclay for Portland cement (PC). This paper reports on a study of such substitution through mechanical properties, microstructure and the hydration products at different ages. The mechanical properties were studied using the compressive strength development of cement mortar. The characteristics of hydration products were analyzed by scanning electron microscope (SEM), X-ray diffraction (XRD), and thermogravimetry analysis (TGA). Our results show that the combination of metakaolin and Nano clay can improve the hydration of cement more effectively with better microstructure and mechanical properties than mixes without them. The calcium hydroxide (CH) and ettringite in cement hydration products were removed effectively due to the substitution of MK and nanoclay, which improved both Al/Ca and Si/Ca ratios of cement hydration products due to the high content of SiO_2 and Al_2O_3.

Biography

Jianqiang Wei is a Ph.D. candidate advised by Professor Christian Meyer and co-advised by Professor Shiho Kawashima in Department of Civil Engineering and Engineering Mechanics at Columbia University in the City of New York. His research is on fiber & microfiber reinforced cement composites, sustainable composite materials, with an emphasis on application and degradation of natural resource in sustainable construction materials, hydration of cement, and advanced nano-modification of cement based material. He is also interested in carbon fibrous reinforced cement, durability of concrete, as well as the improvement of infrastructural materials in micro- or nanoscale.

jw2938@yahoo.com

Poly(acrylic acid)/polyethylene glycol hygrogel prepared by gamma-ray irradiation for mucosa adhesion

Jong-Seok Park, Jong-Bae Choi, Hui-Jeong Gwon, Youn-Mook Lim, Sunng-In Jeong, Young-Min Shin, Phil-Hyun Kang and Young-Chang Nho
Korea Atomic Energy Research Institute, Republic of Korea

Nanogels are internally cross-linked particles of sub-micrometer size made of hydrophilic polymers and are considered a distinct type of macromolecules, compared with linear and branched polymers or macroscopic gels. Silver nanoparticles (Ag NPs) have attracted much attention for centuries due to their unique optical properties, electrical conductivities, oxidative catalysis, and antibacterial effect. In this study, we studied a method of radiation induced synthesis of nanogels containing silver nanoparticle, which allows us to obtain tailored intra-molecularly crosslinked macromolecules of independently chosen molecular weight and dimensions. Thus, we report the possibility of applying the prepared nanogels using poly(acrylic acid) through electron beam irradiation for potential application as biomaterials.

jspark75@kaeri.re.kr

Microstructure and mechanical properties of 7055 Al alloys extrusions by spray forming

Qiao Jisen, Yang Minjie, Xia Hao, Xia Tiandong, Zhao Wenjun, Zhang Han and Duan Ruifen
Lanzhou University of Technology, P.R China

The microstructure, mechanical properties and fracture mechanism of spray formed 7055 aluminum alloy by indirect extrusion and T76 heat treatment were investigated. By adopting optical microscopy, SEM, EDS, XRD and mechanical property analysis, the initial microstructure and the effects of extrusion process and heat treatment on microstructure and mechanical properties of the 7055 alloy were studied. The results show that the as-deposited billet has an equiaxed and homogeneous structure with grain sizes of 20-40 μm and no macro-segregation. After indirect extrusion and T76 heat treatment, the billets were fully densified with a certain amount of recrystallized grains. The ultimate tensile strength of industrial level product at T76 state reaches 680Mpa, and the elongation is 10%.

jammyang@qq.com