

CIVIL, ARCHITECTURAL & ENVIRONMENTAL ENGINEERING



March 16, 2011

Winter 2011

Faculty Focus

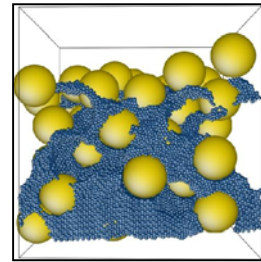
Waring CAREER Award

NCMA Funding

Faculty Research Focus: Priscilla Fonseca



Every year, the volume of manufactured concrete exceeds that of any other man-made construction material in the world. Many new types of cementitious materials are being developed, and yet, the fundamental properties of cement and concrete are still not fully understood. The difficulty in studying cement is largely due to its complex and variable microstructure. Assistant Professor [Priscilla Fonseca's](#) research is directed at determining the driving forces of cement at the nanometric scale that control macroscale properties of concrete. Dr. Fonseca develops predictive models that connect the microstructure of cement to its macroscale properties, such as strength, shrinkage, permeability, and creep. By pinpointing these governing behaviors, rational attempts to modify structural properties can be made by manipulation of its microstructure. Using this approach, it



could then become possible to control certain undesirable characteristics of concrete structures, such as excessive cracking and shrinkage. It also becomes possible to understand the long-term effects of waste materials as admixtures, such as fly ash and ground blast furnace slag. The ultimate goal is therefore to design more predictable and sustainable building materials.

CAREER Award

Assistant Professor [Michael Waring](#) was awarded a CAREER award by the National Science Foundation entitled "CAREER: Time- and size-resolved formation of secondary organic aerosol in indoor air." The research will investigate the secondary organic aerosol (SOA) that forms indoors due to ozone reactions with terpenoids, which are emitted by common indoor consumer products. Exposure to particulate matter in general is linked with adverse health effects, and SOA inhalation depends on the size-distribution that is formed. The project will: experimentally investigate the holistic effect of environmental parameters on SOA formation due to ozone/terpenoid reactions; develop and experimentally validate a model that predicts SOA formation over common ranges of indoor environmental parameters; and apply that model to calculate the SOA exposure for typical Americans under varying conditions. Graduate, undergraduate, and high school students will take part in this research that will improve the indoor environment. The total award for the project is \$402,498.



Continuation of NCMA Funding

Drs. [Ahmad Hamid](#) and [Frank Moon](#) received a continuation grant from the National Concrete Masonry Association for \$75,000 for the project entitled "System-Level Seismic Research of Masonry Buildings". This research utilizes small-scale masonry units to build and test masonry components and systems to investigate the seismic response of reinforced partially grouted masonry buildings. The main outcome of this research is less severe seismic design provisions for low-rise partially grouted reinforced concrete masonry systems which will result in reduced cost of this system relative to steel and timber systems. This will maintain and grow the market share of low-rise masonry systems.

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