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(54) Title: FUNCTIONALLY GRADED BACTERIA CAPSULES FOR CONCRETE SELF-HEALING

(57) Abstract: Herein disclosed is a capsule incorporable into a cement-based material for repairing a crack in the cement-based material. The capsule may comprise an inorganic particle having a surface and a core region, wherein the core region houses a bacterial spore for repairing the crack or wherein the core region houses a bacterial spore for repairing the crack and the capsule houses a nutrient separate from the bacterial spore, wherein the inorganic particle has a density and a strength which decrease in a direction from the surface to the core region, and wherein the density at the surface sufficiently hinders penetration of an alkaline substance. Herein disclosed is a nutrient capsule incorporable into a cement-based material for housing a nutrient which aids a bacterial spore for repairing a crack in the cement-based material. The nutrient capsule may comprise an inorganic particle having a surface and a core region, wherein the inorganic particle has a density and a strength which decrease in a direction from the surface to the core region, and wherein the core region houses the nutrient and the capsule is absent of a bacterial spore. Herein disclosed is a cement-based material incorporated with (i) the capsule or (ii) the capsule and the nutrient capsule. Respective methods of forming the capsule, the nutrient capsule, and the cement-based material are disclosed herein.



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