Şimşek, Barış; **Şimşek, Emir H.**

Assessment and optimization of thermal and fluidity properties of high strength concrete via genetic algorithm. (English) Zbl 1369.90200

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Summary: This paper proposes a response surface methodology (RSM) based genetic algorithm (GA) using MATLAB® to assess and optimize the thermal and fluidity of high strength concrete (HSC). The overall heat transfer coefficient, slump-spread flow and T_{50} time was defined as thermal and fluidity properties of high strength concrete.

In addition to above-mentioned properties, a 28-day compressive strength of HSC was also determined. Water to binder ratio, fine aggregate to total aggregate ratio and the percentage of super-plasticizer content was determined as effective factors on thermal and fluidity properties of HSC. GA based multi-objective optimization method was carried out by obtaining quadratic models using RSM. Having excessive or low ratio of water to binder provides lower overall heat transfer coefficient. Moreover, T_{50} time of high strength concrete decreased with the increasing of water to binder ratio and the percentage of superplasticizer content. Results show that RSM based GA is effective in determining optimal mixture ratios of HSC.

MSC:

90C59 Approximation methods and heuristics in mathematical programming
49N90 Applications of optimal control and differential games
80M50 Optimization problems in thermodynamics and heat transfer
78M32 Neural and heuristic methods applied to problems in optics and electromagnetic theory
62K20 Response surface designs

Keywords:

genetic algorithm; high strength concrete; optimization; thermal properties

Software:

Matlab

Full Text: DOI