

Studi Properti Mekanis Beton dengan Terak Nikel sebagai Substitusi Agregat Halus Menggunakan Digital Image Correlation Analysis = Mechanical Properties Study of Concrete with Nickel Slag as Fine Aggregate Substitutes Using Digital Image Correlation Analysis

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Abstrak

Produksi limbah ferronikel berupa terak nikel di Indonesia mencapai 13 juta ton metrik per tahun. Terak nikel ini belum sepenuhnya diolah dengan baik. Berbagai penelitian telah menyatakan potensi yang dimiliki terak nikel sebagai agregat halus dalam beton. Performa terak nikel sebagai agregat halus beton tercatat cukup baik berdasarkan uji kekuatan berbagai penelitian. Skripsi ini membahas properti mekanik beton dengan substitusi agregat halus terak nikel 0%, 50%, dan 100% dengan agregat halus kontrol pasir manufaktur (M-sand). Penelitian ini akan menganalisis workabilitas, kuat tekan, homogenitas menggunakan UPV, serta karakteristik deformasi dan regangan, berupa kekakuan, modulus elastisitas, dan Poisson's ratio menggunakan digital image correlation (DIC) analysis dan strain gauge. Hasil analisis beton dengan terak nikel secara garis besar memiliki properti mekanis yang lebih baik dibandingkan dengan beton tanpa terak nikel. Beton dengan substitusi terak nikel menunjukkan hasil workabilitas lebih baik, kuat tekan, kecepatan gelombang UPV, dan kekakuan yang lebih besar, serta nilai Poisson's ratio yang lebih rendah dibandingkan beton tanpa substitusi terak nikel. Sedangkan modulus elastisitas dalam penelitian ini masih belum setara dengan perhitungan teoritis. Performa terak nikel sebagai agregat halus beton dalam penelitian ini mengonfirmasi penelitian terdahulu, di mana terak nikel memiliki potensi dan dapat memenuhi potensi tersebut sebagai alternatif agregat halus beton pengganti pasir alami.

.....Ferronickel waste production in the form of nickel slag in Indonesia carry out up to 13 milion metric ton a year. These nickel slags are not yet treated with good measure. A couple of research stated the potential of nickel slag to be used as concrete's fine aggregate. Nickel slag's performance as fine aggregate recorded to be as good as common fine aggregate based on previous research. This report will discuss the mechanical properties concrete with nickel slag fine aggregate 0%, 50%, and 10% substitute with manufactured sand (M-sand) as fine aggregate control. This research will analyse workability, compressive strength, homogeneity using UPV, as well as deformation and strain characteristic, such as stiffness, modulus of elasticity, and Poisson's ratio using digital image correlation analysis and strain gauge. The analysis outcome of concrete using nickel slag has better mechanical properties compared to concrete without nickel slag. Concrete with nickel slag substitute shows better workability, higher compressive strength, pulse velocity, and stiffness, as well as a lower value of Poisson's ratio compared to concrete without nickel slag. Whilst the result of modulus of elasticity in this research have not reach it's theoritical value. Nickel slag's performance as concete's fine aggregate in this research confirm preceding research, where nickel slag has potentials and can fulfill those potentials to becomen concrete fine aggregate alternative as opposed to natural sand.