

The re-use of grinded asphalt as partial replacement of natural aggregates for concrete production

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The paper focuses on the re-use of grinded asphalt as a partial replacement of natural aggregates for concrete production. Concrete mixtures were designed by considering up to 20% (by mass) substitution of natural aggregates. The rheological and mechanical properties of concrete manufactured with grinded asphalt were compared to the reference concrete (RC, w/c ratio equal to 0.53) manufactured by using natural aggregates only. Dry shrinkage and elastic modulus of hardened concrete were also evaluated. The superplasticizer dosage was adjusted to attain a slump value equal to 190 mm at the end of the mixing procedure. The asphalt mixtures showed a marked tendency to bleeding and segregation at the highest substitution percentage. The workability retention up to 60 minutes was also evaluated. A positive effect of recycling aggregates addition was noticed. Concerning the mechanical properties data indicate that the higher the grinded asphalt substitution the lower the compressive strength. In particular, a 50% reduction in compressive strength was noticed for the higher substitution value (20% of natural aggregates). The strongly decrease in the mechanical resistance can be ascribed to the weakness of cement paste/recycling aggregate interface. As a matter of the fact, the reduction of the w/c ratio to 0.45 permits to mitigate this effect. The maximum substitution of the recycling aggregates was limited to 15% to avoid both rheological and mechanical underperformances. Dry shrinkage tests were carried out on reference concrete (w/c ratio equal to 0.53) and grinded asphalt concrete (GAC, w/c ratio equal to 0.45) at 5 and 15% natural aggregates substitution. Similar behavior was evidenced. The experimental results confirmed the possibility to partially replace natural aggregates with grinded asphalt for concrete manufacturing, however the use of recycled material should be restricted to construction of accessory structures such as slabs on grade, etc.