THE UTILIZATION AND PERFORMANCE OF WASTE-TO-ENERGY RESIDUES IN ASPHALT MATERIALS

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The Waste-to-Energy (WTE) bottom ash is stone-like and collected from the municipal solid waste combustion chamber. The fly ash is obtained from the baghouse in the WTE air pollution control system. In the US, the bottom ash and fly ash are usually mixed and aged as combined ash then sent to landfills after passed Toxicity Characteristic Leaching Procedure (TCLP), leading to a waste of large proportion of mineral resources. The WTE power plants spend substantial financial cost each year for transportation and disposal of these residues (around $54.44/ton). Among them, the fine size combined ash (<2 mm) has around 5 wt.% of aluminum and active in chemical reactions, which is the challenging fraction of ash in landfills because of heavy metals leaching. In this study, the performance of milled fine combined ash in bituminous mixtures is studied. The heavy metals in fine combined ash are encapsulated and stabilized/solidified by asphalt.

In this study, we will explore the possibility of using the fine combined ash as fillers (e.g., 0%,10%, 20%, and 30% by weight) in the asphalt mastic in order to improve the thermal and electrical properties of asphalt materials, a key step to achieve self-heated asphalt pavements for snow melting in winter and surface cooling in summer. The combined ash will be added to the asphalt binder using a mechanical shear mixer together with an oil-bath or a heat press. The thermal diffusivity and conductivity of the samples will be measured using the Nanoflash and a differential scanning calorimeter. The electrical conductivity of the samples will be tested using the two-probe method. The morphology and the mechanical properties of the samples will be studied using the digital microscope and rheometer. Performance of the samples will be compared and optimal recipe will be determined for further use in the asphalt mixtures.