HIGH PERFORMANCE GASOLINE PARTICULATE FILTERS AT ZERO AND LOW MILEAGE

Xin Liu[1], Christine Lambert[1], Matti Maricq[2]
[1]Ford Motor Co., [2]Ford Motor Co

Gasoline particulate filter (GPF) technology is in growing demand with the increasingly tight vehicle emission standards for particulate matter being implemented in US, EU, China and elsewhere. However, a great challenge remains in developing high performance GPFs with low cost, compact size, low backpressure as well as high efficiency particularly at zero or low ash accumulation. Choices of filter media are still limited due to requirement for thermal, chemical and mechanical durability as well as compact size for packaging. The current main option for GPFs is porous cordierite with alternatively plugged honeycomb structure adopted from Diesel Particulate Filter (DPF) structure. Porous cordierite is also washcoat compatible, which can provide filters with desirable catalytic function to promote soot oxidation and gas conversion. Structure of porous cordierite is therefore a combination of several factors, pore size and porosity of bare substrate as well as loading and location of washcoat. In addition, low amount of ash deposits (non-combustible residue from upstream exhaust) introduced by mileage accumulation during engine break-in could significantly increase the filtration efficiency. Fundamental understanding on interaction between bare substrate, washcoat and ash is critical to optimize design for high efficiency with low backpressure. However, reports in this regard are still limited. In the current work, bare and coated GPFs at zero mileage (without ash) and low mileage (with low amount of ash accumulation) were studied. The filter performance including filtration efficiency, backpressure and their response to soot loading were evaluated on an aerosol test bench. Results were discussed to understand the impact of washcoat and low mileage accumulation and seek opportunities for improvement.