Lowering laboratory and real driving particle emissions of direct injection spark ignition engines with n-butanol and isobutanol blends.

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The emissions of a typical automobile direct injection spark ignition engine were evaluated both in the laboratory and during real driving. In the laboratory, particle mass and number emissions, particle size distributions and regulated and unregulated gaseous emissions were evaluated online, and particles were sampled by high-volume samplers for chemical analyses and toxicity assays. Due to the known deficiencies of the NEDC cycle, WLTP, US06 and Artemis driving cycles were used. During real driving, particle size distribution were measured using a portable on-board emissions monitoring systems. To evaluate the effects of candidate renewable oxygenated fuels, the vehicle was tested using non-oxygenated gasoline and its blends with a) 15% ethanol, b) 25% n-butanol, and c) 25% isobutanol, with all oxygenated blends having similar content of oxygen by mass.
While ethanol had only moderate effects during real driving and negligible effect during laboratory tests, blends of both butanol isomers have resulted in consistent and significant reduction in particle number emissions, both in the laboratory and during real driving. Comparison of size distributions of all particles with total count of non-volatile particles > 23 nm suggest that about half particles are smaller than 23 nm, and about half of the particles larger than 23 nm are volatile. Thermogravimetric analysis (EC/OC) shows, however, that elemental carbon accounts for most of the weight found during gravimetric analysis, suggesting that most of the larger particles are solid.
Tens of mg of particulate matter were collected per fuel for subsequent toxicity assays
(Honzo, mám psát že výsledky budou předneseny, nebo nic?)