

1. Record Nr.	UNINA9910795594303321
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Titolo	Experimental investigations on particle number emissions from GDI engines // Markusa Bertsch
Pubbl/distr/stampa	Berlin : , : Logos Verlag, , [2016] ©2016
ISBN	3-8325-9978-9
Descrizione fisica	1 online resource (170 pages)
Collana	Forschungsberichte aus dem Institut für Kolbenmaschinen
Disciplina	621.4
Soggetti	Engines - Design and construction
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	PublicationDate: 20161231
Sommario/riassunto	<p>Long description: This thesis discusses experimental investigations to reduce particle number emissions from gasoline engines with direct injection. Measures on a single cylinder research engine with combined usage of a particle number measurement system, a particle size distribution measurement system as well as optical diagnostics and thermodynamic analysis enable an in-depth assessment of particle formation and oxidation. Therefore, numerous optical diagnostic techniques for spray visualisation (Mie-scattering, High-Speed PIV) and soot detection (High-Speed-Imaging, Fiber optical diagnostics) are deployed. Two injectors with different hydraulic flows but identical spray-targeting are characterised and compared by measurements in a pressurised chamber. The operation at higher engine load and low engine speed is in the focus of the experimental work at the engine test bench. Thereby, the low flow velocities in the combustion chamber, caused by the low engine speed, as well as the large amount of fuel injected are major challenges for the mixture formation process. A substantial part of the thesis thus focusses on the detailed analysis of the mixture formation process, which is consisting of fuel injection, interaction of the in-cylinder charge motion with the fuel injected and the fuel properties. Measures for the optimisation of the mixture formation process and the minimisation of the particle number</p>

emissions are analysed and evaluated. The charge motion is manipulated by the impression of a directed flow, the variation of the valve timings and valve open curve. The injection process is influenced by a reduction of the hydraulic flow of the injector and an increase of the injection pressure up to 50 MPa. The investigations show fundamental effects and potentials of different variation parameters concerning their emissions reduction potential at the exemplary operation at high engine load. Due to the simultaneous analysis of the in-cylinder charge motion and a thermodynamic analysis, the results can be transferred to different engines.
