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Sommario/riassunto	Long description: In spite of progress in the development of alternative powertrain systems and energy sources, the internal combustion and all its derivatives still are and will be the main powertrain for automobiles. In SI-engines, several approaches compete with each other like the controlled auto ignition (CAI or HCCI), throttle-free load control using variable valvetrains, stratified mixture formation with lean engine operation or highly turbo charged downsizing concepts all combined with gasoline direct injection. The presented work makes a contribution for a deeper understanding of the combustion process of a turbo charged direct injection engine operating with external EGR as well as lean stratified mixture. Using detailed test bench investigations and introducing a new optical measurement tool, the combustion process is described in detail focusing on the occurrence of non-premixed combustion phenomena. The influence of engine parameters like global and local air-/fuel ratio, external EGR and fuel rail pressure as well as the influence of fuel parameters are discussed giving a characterization of the combustion process of stratified engine operation. Furthermore, the influences of non-inert exhaust gas components on engine knock tendency are investigated using external EGR with an EGR catalyst. Opposing the results to numerical analysis, combustion characteristics of turbo charged DISI-engines are

presented.
