

Название публикации:

Semitransparent ceramic heat-insulation of eco-friendly Low- Heat-Rejection diesel

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Аннотация:

Efficiency of diesel has been studied using well-known types of the ceramic heat-insulating HICs- or thermal barrier TBCs-coatings. This problem is relevant for a high-speed diesel combustion chamber in which an intensive radiant component (near IR) reaches ~50% within total thermal flux. Therefore, in their works the authors had been offering new concept of study these materials as semitransparent SHICs-, STBCs-coatings. On the Mie scattering theory, the effect of selection of the specific structural composition and porosity of coatings on the variation of their optical parameters is considered. Conducted spectrophotometric modeling of the volume-absorbed radiant energy by the coating had determined their acceptable temperature field. For rig testings, a coated piston using selected SHIC (PSZ-ceramic $ZrO_2+8\%Y_2O_3$) with a calculated optimum temperature gradient was chosen. A single cylinder experimental tractor diesel was used. At rotation frequency $n > 2800$ rpm, the heat losses were no more than 0.2 MW/m². Executed testings showed ~2-3% lower specific fuel consumption in contrast to the diesel with an uncoated piston. Effective power and drive torque were ~2-5% greater. The authors have substantiated the growth the efficiency of this Low-Heat-Rejection(LHR) diesel due to the known effect of soot deposition gasification at high speed. Then unpolluted semitransparent ceramic thermal insulation forms the required thermoradiation fields and temperature profiles and can affect regulation of heat losses and a reduction of primarily nitrogen dioxide generation. © Published under licence by IOP Publishing Ltd.

Ключевые слова:

Ceramic materials, Combustion chambers, Control systems, Heat losses, Heat sinks, Nitrogen oxides, Pistons, Temperature, Temperature control, Thermal barrier coatings, Zirconia