Название публикации:

Development of a semitransparent ceramic heat-insulation for an eco-friendly combustion chamber of Low-Heat-Rejection diesel

Авторы:

Merzlikin, V.G.a,b, Gutierrez, M.O.c, Makarov, A.R.d, Bekaev, A.A.a, Bystrov, A.V.b, Zagumennov, F.A.e

a. Department of Technology and Equipment of Mechanical Engineering, Moscow Polytechnic University, Bolshaya Semenovskaya, 38, Moscow, Russian Federation

b. Industrial Economics Department, Plekhanov Russian University of Economics, Stremyanny, 36, Moscow, Russian Federation

c. Tablet School Company, General Maldonado y Belisario Quevedo, Latacunga, Ecuador

d. Department of Mechanical Engineering and Instrument Making, RUDN University, Miklukho-Maklaya, 6, Moscow, Russian Federation

e. Department of Instrument Production Techniques, Bauman Moscow State Technical University, 2-ya Baumanskaya, 5/1, Moscow, Russian Federation

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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 intensive radiant component (near IR) reaches ∼50% within total thermal flux. Therefore, in their papers the authors offered 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 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/m^2. Executed testings showed ∼2-3% lower specific fuel consumption in contrast the diesel with 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 reduction of primarily nitrogen dioxide generation.

Ключевые слова:

Ceramic materials, Coatings, Combustion chambers, Energy efficiency, Fuel consumption, Heat losses, Heat sinks, Insulation, Intelligent systems, Nitrogen oxides, Pistons, Temperature, Temperature control, Thermal barrier coatings, Traffic control, Zirconia, Zirconium compounds, Low heat rejection, Mie scattering theory, Porosity of coatings, Rotation frequencies, Semi-transparent ceramics, Specific fuel consumption, Structural composition, Temperature profiles, Thermal insulation