

### From the Guest editors

Last year for the first time one issue of the journal *Thermal Science* was dedicated to internal combustion engines, as research of thermal processes taking place in this field are of interest to scientists. This was confirmed by the large number of submissions to this journal in the meantime in this field. Therefore, we have decided to dedicate another issue of the journal *Thermal Science* to the problem of IC engine thermal processes, with special attention paid on the application of alternative fuels.

Solving problems of providing sufficient amounts of fuel for transport needs and emission reduction were the subject of many activities in the world. Solving these problems is important as all predictions show that the number of vehicles will grow in the following period. Emission reduction from traffic should be analyzed together with reducing greenhouse gas emission in accordance with the Kyoto Protocol.

As a result of these activities in June 2009 the European Union replaced the 2003/30/EC Directive with the 2009/28/EC Directive, referring to promoting the use of energy from renewable sources. According to the new Directive, EU members are obliged to provide at least 10% of the total fuel amount from renewable sources by 2020. Additionally, biofuel, as the most significant renewable energy source must comply with the sustainability criterion and a methodology for calculating its influence on the greenhouse gas emission was precisely defined.

At the same time, introduction of special fuel requirements referring to the carbon content were proposed in California, *i. e.* introduction of the low carbon fuel standard (LCFS) was proposed that should promote the use of fuel with a low carbon content (for example, bioethanol and biodiesel that comply with sustainability criteria, compressed natural gas).

For attaining the stated goals in the transport field, intensive research that would include different thermal processes both in the production of suitable fuel/biofuel and also internal combustion engines are needed with the purpose of increasing energy efficiency and reducing the emission of toxic components.

In the short-term, increasing energy efficiency and applying first generation biofuel stand out as the most significant research. First generation biofuel produced from agricultural raw materials are especially suitable as they do not require significant changes on the engines (if used mixed with conventional fuel – petrol and diesel) or they require slight changes to the engine and vehicle. Research in obtaining first generation biofuel will include possibilities of production from raw materials that comply with the sustainability criterion (for example, jatropha, orange skin powder, ...).

In the long-term, second generation biofuel will be the subject of research in order to obtain biofuel of suitable quality from ligneous-cellulose materials (agriculture, wood biomass and wood industry residues) for economically acceptable costs. At the same time one should expect more research in the field of “bio-refineries”, where this term denotes converting biomass using thermal-chemical and biological processes into a large number of products including biofuel for transport. Long-term applications should also take into account the use of hybrid electric drive and fuel cells.

All the stated future expectations indicate a wide field of different research in the field of internal combustion engines, from investigating different thermal-chemical processes of obtaining biofuel and their possible application in internal combustion engines, to investigating thermal processes in engines from the viewpoint of reliable operation, engine performances, energy efficiency, and emission. This research diversity can be seen in the papers published in this journal issue.

The guest editors would like to express gratitude to all authors and reviewers involved in preparation of this issue.

*Guest editors of this Special issue*

*Assoc. Prof. Dragoslava Stojiljković, Ph. D.*  
Faculty of Mechanical Engineering,  
University of Belgrade, Belgrade, Serbia

*Prof. Stojan Petrović, Ph. D.*  
Faculty of Mechanical Engineering  
University of Belgrade, Belgrade, Serbia