

# PROCEEDINGS

of the Eighth Asia-Pacific International Symposium on Combustion and  
Energy Utilization (8<sup>th</sup> APISCEU)

October 10-12, 2006

Venue

Zapolarye Health & Spa Center, Sochi, Russian Federation

CD version



Sochi - 2006

# 8<sup>th</sup> APISCEU

## Jointly Organized by

Institute of Engineering Thermo-Physics, Chinese Academy of Sciences, China  
Institute of Applied Mechanics, Ural Branch of the Russian Academy of Sciences,  
Izhevsk, Russian Federation  
Sochi Research Center, Russian Academy of Science, Sochi, Russian Federation

## 8<sup>th</sup> APISCEU Co-organized by the Following Organizations and Institutions

Institute of Engineering Thermo-Physics, Chinese Academy of Sciences, China  
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Sochi Research Center, Russian Academy of Science, Sochi, Russian Federation  
Institute of Applied Mechanics, Ural Branch of the Russian Academy of Sciences,  
Izhevsk, Russian Federation  
Scientific Council on Combustion and Explosion of the Presidium of the  
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Editors:

Alexey M. Lipanov

Alexander N. Lukin

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## Preface

The Eighth Asia-Pacific International Symposium on Combustion and Energy Utilization (8<sup>th</sup> APISCEU) is the eighth of a series of symposia organized to provide a forum for researchers in the areas of combustion and energy utilization for exchanging scientific ideas and discussing the common problems amongst Asia-Pacific countries. This series of symposia was first held in Beijing in 1990 with the Chinese Academy of Sciences and the Hong Kong Polytechnic University as joint organizers. The second symposium was held in Beijing in 1993. The third symposium was held in Hong Kong in 1995. The 4th APISCEU was held in Bangkok in 1997, the 5th APISCEU was held in Shanghai in 1999, the 6th APISCEU was held in Kuala Lumpur in 2002 and the 7th APISCEU was held again in Hong Kong SAR, in 2004 at the Hong Kong Polytechnic University.

Due to the kind invitation, provided by the International Organizing Committee of the Symposium, the next, eighth Symposium is organized in Sochi, the famous Russian recreation resort on the Black Sea shore.

This is a three-and-one-half-day symposium with 60 technical papers accepted for presentation and with two invited keynote papers. The invited talks cover two broad topics; they are some problems in fundamental combustion and combustion diagnostics. Invited speakers are specialists in their own areas and they are from China and Russia. There are five technical sessions and they cover areas such as combustion fundamentals, alternative fuels and renewable energy, computational combustion, combustion diagnostics and emission control of the solid waste combustion. These topics are of relevance to situations in Russia and in the Asia-Pacific region. The technical sessions provide a forum where the latest research is presented, discussed and where new research is stimulated. Equally significant, the symposium provides a meeting place for researchers to interact, to exchange new ideas, to renew old friendships, and to forge new ones in the spirit of scientific collaboration and camaraderie.

The Local Organizing Committee would like to take this opportunity to welcome all delegates to Sochi. We hope that you will find the technical sessions stimulating and that you will leave each session with new thoughts and ideas. We, however, hope that you will not just immerse in the technical sessions, but also take time out to see beautiful Sochi and thoroughly enjoy your stay in this diversified city. No matter what time of the year you come here, the picture is the same - sunshine and greenery all over. There are few cities in the world so rich in greenery as Sochi. Three-quarters of its territory are under parks and gardens with 85 per cent of evergreens. Sochi has something for everyone.

The Local Organizing Committee also would like to take this opportunity to thank the co-organizers, the International Organizing Committee, the Technical Organizing Committee for a job well done in its selection of the technical papers, and the Sochi Tourist Company - Joint-Stock Company "SG Tours".

The Local Organizing Committee would like to thank the sponsors of this symposium for their support; these include the Union of Scientific and Engineering Societies of the Udmurtia Republic (Izhevsk, Udmurtia Republic, Russia) and Research & Production Association of the Special Materials (Saint Petersburg, Russia).

Finally, we wish to thank the members of the Symposium Scientific Committee, the authors of all the Symposium papers and, last but not least, you, the participants in this Symposium, for its success and its influence on the continued success and growth of all future APISCEU meetings.



Alexey M. Lipanov  
Co-Chairman

Local Organizing Committee 8<sup>th</sup> APISCEU  
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**Dr. KIZILOVA, O.V.**

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# Opening Ceremony

**October 10, 2006**

**Venue: Big Hall of the Zapolarye Health & Spa Center**

- 09:00 Introduction  
Prof. A.M. LIPANOV  
Director, Institute of Applied Mechanics,  
Ural Branch of the Russian Academy of Sciences  
Co-Chairman, Local Organizing Committee, 8th APISCEU, Russia
- 09:03 Welcoming Speech  
Prof. ZAHNG, XIAOQIAN  
Institute of Engineering Thermo-Physics,  
Chinese Academy of Sciences, China  
Chairman, International Organizing Committee of the APISCEU
- 09:10 Welcoming Speech  
Prof. M.M. AMIRKHANOV  
Director, Sochi Research Center,  
Russian Academy of Science  
Co-Chairman, Local Organizing Committee, 8th APISCEU, Russia
- 09:17 Opening Speech by the Guest of Honor  
SOCHI Administration, Russia
- 09:21 Welcoming Speech  
Prof. HUANG ZHAOXIANG  
Institute of Engineering Thermo-Physics  
Chinese Academy of Sciences, China  
Honorary Chairman of the International Organizing  
Committee of the APISCEU
- 09:25 Ribbon Cutting Ceremony

# Technical Program

## The Eighth Asia-Pacific International Symposium on Combustion and Energy Utilization

10-12 October 2006, Sochi, Russian Federation

### October 09, 2006 (Monday)

- 14:00 – 18:30 Registration, Hall of the Zapolarye Health & Spa Center  
18:30 – 23:00 Welcome Dinner, Restaurant of the Zapolarye Health & Spa Center

### October 10, 2006 (Tuesday)

- 08:00 – 09:00 Registration, Hall of the Zapolarye Health & Spa Center  
09:00 – 09:25 Opening Ceremony, Big Hall of the Zapolarye Health & Spa Center  
09:30 – 10:40 Keynote Session, Big Hall of the Zapolarye Health & Spa Center  
11:00 – 12:20 Technical Sessions, Big Hall of the Zapolarye Health & Spa Center  
12:20 – 14:00 Lunch, Restaurant of the Zapolarye Health & Spa Center  
14:00 – 18:00 Cultural Program: Sightseeing Tour of Sochi and Visit to the  
Joseph Stalin's Dacha (Summer Residence)

### October 11, 2006 (Wednesday)

- 08:30 – 09:30 Registration, Hall of the Zapolarye Health & Spa Center  
09:00 – 12:20 Technical Sessions, Big Hall of the Zapolarye Health & Spa Center  
12:20 – 14:00 Lunch, Restaurant of the Zapolarye Health & Spa Center  
14:00 – 18:00 Technical Sessions, Big Hall of the Zapolarye Health & Spa Center

### October 12, 2006 (Thursday)

- 09:00 – 12:40 Technical Sessions, Big Hall of the Zapolarye Health & Spa Center  
12:40 – 14:00 Lunch, Restaurant of the Zapolarye Health & Spa Center  
14:00 – 17:00 Technical Sessions, Big Hall of the Zapolarye Health & Spa Center  
17:00 – 17:40 Poster Sessions, Big Hall of the Zapolarye Health & Spa Center  
19:00 – 23:00 Symposium Banquet (Restaurant of the Zapolarye Health & Spa Center)

# **Keynote Session - Invited Keynote lectures**

**Date:** October 10, 2006 (Tuesday)

**Venue:** Big Hall of the Zapolarye Health & Spa Center

**Time:** 09:30 – 10:40

**Session Chair:** Prof. Toshisuke Hirano

**09:30 – 10:05**

**KN-101** Study on Flow and Combustion Visualization  
Prof. Shi Liu  
Institute of Engineering Thermo-Physics, CAS, China

**10:05 – 10:40**

**KN-102** On the Use of Renewable Energy Sources  
Prof. Alexey M. Lipanov  
Institute of Applied Mechanics, UB of the RAS, Russian Federation

**10:40 – 11:00** Tea Break

# Technical Sessions

## October 10, 2006

AM 09:00 – 09:25

Big Hall of the Zapolarye Health & Spa Center  
Opening Ceremony

AM 09:30 – 10:40 (Tea break: 10:40 – 11:00)

Big Hall of the Zapolarye Health & Spa Center  
Keynote Session (Invited Lecturers)

AM 11:00 – 12:20

Big Hall of the Zapolarye Health & Spa Center  
Combustion Diagnostics - CD  
Fundamental Combustion - FC

## October 11, 2006

AM 09:00 – 12:20 (Tea break: 10:40 – 11:00)

Big Hall of the Zapolarye Health & Spa Center  
Fundamental Combustion - FC

PM 14:00 – 18:00 (Tea break: 15:40 – 16:00)

Big Hall of the Zapolarye Health & Spa Center  
Fundamental Combustion - FC  
Computational Combustion – CC (16:20 – 18:00)

## October 12, 2006

AM 09:00 – 12:40 (Tea break: 10:40 – 11:00)

Big Hall of the Zapolarye Health & Spa Center  
Alternative Fuel / Renewable Energy – AF

PM 14:00 – 17:00 (Tea break: 15:40 – 16:00)

Big Hall of the Zapolarye Health & Spa Center  
Emission Control - EC

## Poster Session

PM 17:00 – 17:40

Big Hall of the Zapolarye Health & Spa Center  
Fundamental Combustion - FC  
Alternative Fuels an Renewable Energy - AF  
Emission Control - EC

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*Y.C. Law, C.C. Li, J.T. Yang, K.K. Wu, and J.L. Cheng*

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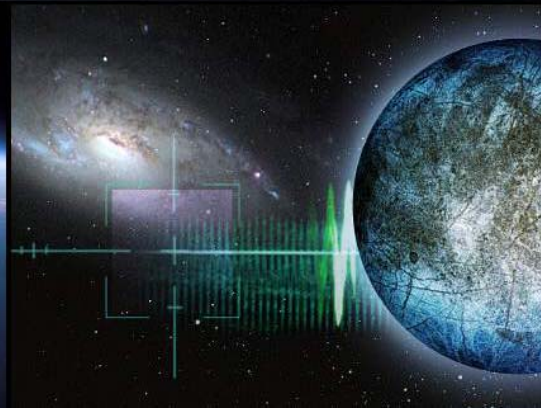
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