

# JOURNAL OF PLASMA AND FUSION RESEARCH

The Journal of the Japan Society of Plasma Science and Nuclear Fusion Research

Vol. 83, No.5, May 2007

## Commentary

|  |                                     |     |
|--|-------------------------------------|-----|
| Emission Spectrochemical Analysis Using Laser-Induced Plasma Spectroscopy<br>..... | KAGAWA Kiichiro and IDRIS Nasrullah | 401 |
|--|-------------------------------------|-----|

## Special Topic Article

|  |  |     |
|--|--|-----|
| Present Status and Future Perspectives of Toroidal Plasma Development Research towards<br>Steady-State Operation of Fusion Plasmas |  |     |
| 1. Prologue .....  | IDE Shunsuke, TAKASE Yuichi and OHYABU Nobuyoshi | 413 |
| 2. Present Status of Steady-State Research   |  |     |
| 2.1 Present Status of Tokamak Research towards Steady-State Operation .....  | IDE Shunsuke                                     | 415 |
| 2.2 Present Status of ST Research towards Steady-State Operation<br>.....  | TAKASE Yuichi and MAEKAWA Takashi                | 423 |
| 2.3 Present Status of Helical Device Research towards Steady-State Operation .....   | OHYABU Nobuyoshi                                 | 429 |
| 3. Issues towards Steady-State Operation and Approaches to Their Solutions   |  |     |
| 3.1 Current Profile Control in Advanced Tokamak Plasmas .....  | SUZUKI Takahiro                                  | 434 |
| 3.2 Control of High Confinement Plasmas .....  | SAKAMOTO Yoshiteru and IDA Katsumi               | 439 |
| 3.3 Avoidance and Suppression of MHD Instability .....   | OZEKI Takahisa and WATANABE Kiyomasa             | 446 |
| 3.4 Fuelling and Heat / Particle Control .....   | TAKENAGA Hidenobu and MORISAKI Tomohiro          | 453 |
| 4. Epilogue .....  | IDE Shunsuke, TAKASE Yuichi and OHYABU Nobuyoshi | 460 |

## Lecture Note

|  |   |     |
|--|---|-----|
| Research Guidance to Fast-Flowing Plasmas and Shock Waves                          |   |     |
| 5. Research Status of Fast Flows and Shocks in Laboratory Plasmas                  |   |     |
| 5.1 Model Experiments of Astrophysical Phenomena with Intense Lasers .....         | TAKABE Hideaki                                  | 465 |
| 5.2 High-Speed Plasma Flows and Detonation Waves in Laser Propulsion .....         | SASOH Akihiro                                   | 472 |
| 5.3 Critical Velocities in a Plasma .....  | TANAKA Masayoshi Y.                             | 477 |
| 5.4 Supersonic Plasma Flow and Shock Waves in Various Magnetic Channels<br>.....   | INUTAKE Masaaki and ANDO Akira                  | 483 |
| 5.5 Pulsed Plasma by Electromagnetic Acceleration and Formation of Spheromak ..... | NAGATA Masayoshi                                | 491 |
| 5.6 Fast Plasma Flow in Tokamak Divertor and Scrape-Off Layer .....                | ASAKURA Nobuyuki                                | 501 |
| 5.7 High Speed Flow in Toroidal Plasmas – Poloidal Shock<br>.....                  | ITOH Kimitaka, KASUYA Naohiro and ITOH Sanae-I. | 509 |
| 5.8 Generation of Strong Rotation Flow and High-Beta Confinement of Plasmas .....  | YOSHIDA Zensho                                  | 515 |

## Review Paper

|   |   |     |
|---|---|-----|
| Spatiotemporal Synchronization of Coupled Oscillators in a Laboratory Plasma<br>..... | FUKUYAMA Takao, KOZAKOV Ruslan, TESTRICH Holger and WILKE Christian | 521 |
|---|---|-----|

## Summary of Doctoral Thesis

|  |                  |     |
|--|------------------|-----|
| Experimental Study of Transport and Fluctuation in Helical Plasmas Using Beam Emission Spectroscopy<br>..... | OISHI Tetsutarou | 528 |
|--|------------------|-----|

|                     |  |     |
|---------------------|--|-----|
| PFR Abstracts ..... |  | 532 |
|---------------------|--|-----|

|                   |  |     |
|-------------------|--|-----|
| Information ..... |  | 533 |
|-------------------|--|-----|

|                                |  |     |
|--------------------------------|--|-----|
| Plasma & Fusion Calendar ..... |  | 535 |
|--------------------------------|--|-----|

|                    |  |     |
|--------------------|--|-----|
| Announcement ..... |  | 536 |
|--------------------|--|-----|

|  |  |     |
|--|--|-----|
| List of Newly Arrived Publications, NIFS ..... |  | 538 |
|--|--|-----|

|              |  |     |
|--------------|--|-----|
| Errata ..... |  | 543 |
|--------------|--|-----|

## Cover

The SEM micrographs of tungsten surface exposed to helium plasma in divertor simulator NAGDIS-II (Nagoya University) taken before ((a), (c), and (e)) and after ((b), (d), and (f)) laser pulse irradiation. (b): Nd:YAG laser at a pulse energy of  $2 \text{ kJm}^{-2}$ . (d) and (f): Ruby laser at those of 70, and  $580 \text{ kJm}^{-2}$ , respectively. (Shin KAJITA, *et al.*, Plasma and Fusion Research Vol.2, 009 (2007). <http://www.jspf.or.jp/PFR/>)