

**OS4: Flow Dynamics and Combustion Technology of Hybrid Rocket Propulsion,
11th Edition**

November 7, 2019

EX-3

- OS4-1 **Progress on Hybrid-Hybrid Propulsion Technology Development** (*Invited*)
9:00-10:00 Meng-Che Li, Shih-Sin Wei, Yu-Chieh Cheng, Alfred Lai, Yeh Lu, Tzu-Hao Chou, Jong-Shinn Wu (National Chiao Tung University, Taiwan)
- OS4-2 **Role and Prospect of Hybrid Rocket Technology in Promoting Space Tourism**
10:00-10:30 Toru Shimada (Japan Aerospace Exploration Agency, Japan)
- OS4-3 **Design and Tests of a Throttleable Hybrid Rocket Engine with Direct-Drive Thrust Vector Control**
10:40-11:10 Meng-Che Li, Shih-Sin Wei, Jong-Shinn Wu (National Chiao Tung University, Taiwan)
- OS4-4 **Progress on Developing a Quad Hybrid Rocket Engine Levitating Platform (4-HELP)**
11:10-11:40 Yueh Lu, Yu-Jen Hou, Jhen-Wei Huang, Yu-Lin Liu, M.-C. Li, Shih-Sin Wei, Tsung-Lin Chen (National Chiao Tung University, Taiwan), Ming-Tzu Ho (National Chiao Tung University / National Cheng Kung University, Taiwan), Jong-Shinn Wu (National Chiao Tung University, Taiwan)
- OS4-5 **Evaluation of Laser Ranging Method Error in Time-Averaged Fuel Regression Rate Measurement**
11:40-12:10 Genya Naka, Jérôme Messineo, Koki Kitagawa, Carmine Carmicino, Toru Shimada (Japan Aerospace Exploration Agency, Japan)
- OS4-6 **Experiment on Air Intake Performance of Ejector-Jet using Wax-based Fuel Hybrid Rocket.**
13:40-14:10 Ichiro Nakagawa, Shunichi Funaki (Tokai University, Japan), Takeshi Kanda (Chubu University, Japan), Susumu Hasegawa (Japan Aerospace Exploration Agency, Japan)
- OS4-7 **Initial Firing Tests of Aluminum-Water Hybrid Rockets using PMMA-Oxygen Hybrid Rocket Combustion**
14:10-14:40 Yuji Saito (Tohoku University, Japan), Landon Kamps, Ayumu Tsuji, Masashi Wakita (Hokkaido University, Japan), Hiroyuki Koizumi (The University of Tokyo, Japan), Taku Nonomura, Keisuke Asai (Tohoku University, Japan), Harunori Nagata (Hokkaido University, Japan)
- OS4-8 **Wax Fuel Hybrid Rocket Basic Research On Improving Combustion Efficiency**
14:50-15:20 Koki Yasuda, Ichiro Nakagawa (Tokai University, Japan)
- OS4-9 **Combustion Characteristics of Wax-based Solid Fuel for Hybrid Rocket with Adding AN**
15:20-15:50 Tatsuya Kitagawa, Akiyo Takahashi, Kenichi Takahashi (Nihon University, Japan), Yosuke Nishiwaki, Mieko Kumasaki (Yokohama National University, Japan)

- OS4-10 **Transient Burning of Molten Wax Fuel in the Pre-combustion Chamber of Hybrid Rocket Motors**
15:50-16:20 Mayumi Hayashi, Sho Sasahara, Sho Kojima, Takakazu Morita (Tokai University, Japan)
- OS4-11 **Effect of Nozzle Throat Erosion on the Performance of a H₂O₂-PP Hybrid Rocket Motor with Swirling Injection**
16:30-17:00 Shih-Sin Wei, Meng-Che Lee, Yu-Hsuan Chien, Tzu-Hao Chou, Jong-Shinn Wu (National Chiao Tung University, Taiwan)
- OS4-12 **Progress on Developing the 1000-kgf Class N₂O-PP Hybrid Rocket Motor Using Swirling Injection**
17:00-17:30 Yu-Chieh Cheng, Alfred Lai, Shih-Sin Wei, Tzu-Hao Chou, Jong-Shinn Wu (National Chiao Tung University, Taiwan)