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	専門分野	流体力学, 空気力学

## 対応可能な分野

### 1. High Speed Flows

Investigation of aero-thermodynamic features of supersonic/hypersonic flows, such as supersonic jets, re-entry vehicles.

### 2. Shock Waves

Control of shock waves and accompanying flows, shock boundary interactions, etc.

### 3. Utilization of Green Energy

Investigation of thermo-fluidic features of high pressure H<sub>2</sub> and supercritical CO<sub>2</sub> gases for the development of H<sub>2</sub> and CO<sub>2</sub> based energy technologies, such as supercritical CO<sub>2</sub> based turbine for power generation.

### 4. Microfluidics

Investigation of flow in micro/nano scale devices, development of microfluidic devices, etc.

## 研究内容

### ■ High Speed Flows - Supersonic cavity flow and supersonic jet

Intense pressure oscillations in supersonic cavity flows is an important issue to solve because of its detrimental effects in many aerodynamic applications such as severe structural vibration and fatigue of aircraft wheel wells and weapon bays. These also increase aircraft noise and drag, and they may cause instrumentation failure. An extensive study is necessary to investigate these flows and their interaction with solid boundary.

### ■ Shock Wave - Control of shock wave and shock boundary interaction

Airfoil is a primary element to be designed for an aircraft. The formation of shock waves can cause flow separation over the top and bottom surfaces. Thus, the control of shock wave is really an important issue to be considered and the control using passive techniques is extremely important. In addition, the shock waves are also found forming in many engineering applications. A thorough investigation is necessary to control the shock wave and the effect of their interaction.

### ■ Utilization of Green Energy - Flow features of high pressure H<sub>2</sub> gas

H<sub>2</sub> gas, a sustainable and green energy carrier, can meet our current and future energy needs without sacrificing the cultural and economic growth, the environment or the ability of future generations to live even better than we do today. The advent of H<sub>2</sub> based technologies, such as H<sub>2</sub> powered vehicles and H<sub>2</sub> based power generation plants, has highlighted the need of storing for its clean and efficient conversion to energy. At present, pressurized gas cylinders represent the simplest and most mature technology for H<sub>2</sub> storage. Thus, it is an extreme need to investigate the flow features of H<sub>2</sub> gas during high pressure filling. As the combustion temperature of H<sub>2</sub> gas are too high, the investigation of H<sub>2</sub> gas flow in turbine under the high pressure condition is necessary for the development of H<sub>2</sub> based power generation system as well.

### ■ Microfluidics - Development of micromixer

Recently, microfluidic chips ( $\mu$ TAS) incorporating micromixer are widely used in various fields such as biotechnology, medical, environmental, and chemical engineering. Micromixing draws an intense attention, and performing an effective mixing in microscale becomes a critical issue to be solved.

## 主な使用機器・設備など

Compressor, Optical Schlieren apparatus, Pressure-temperature transducers, High-speed computers for CFD analysis, etc.

## 産学連携に関する実績

- Performed joint research on high pressure filling of H<sub>2</sub> cylinder