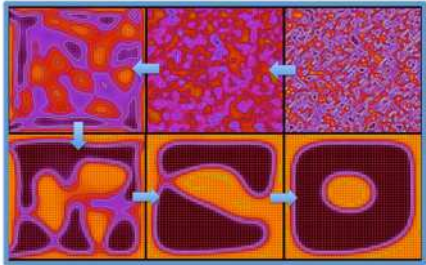


Name	Job Title	Area of Expertise
YAMAGUCHI Tomohiko	Professor	Thermal Engineering
1. Main Research Topics ① Measurement of sound speed in gas We accurately measure the speed of sound in gases from -20°C to 80°C and from 100 kPa to 1 MPa by using a spherical resonator. The speed of sound of hydrogen can be measured with an uncertainty of several hundred ppm by this apparatus. On the measurement of the sound speed of hydrogen sealing is difficult due to its small molecules and difficult to measure with high precision due to its high speed of sound. From the sound speed data, it is possible to calculate the specific heat of an ideal gas state, which is necessary for estimating thermal properties by equation of state. 		
② Development of global equation of state We are developing a general equation of state that can be applied to various fluids, using excess Gibbs energy (activity coefficient) calculated by the group contribution method. I have developed the Volume and g^E Translated Peng-Robinson (VTPR) equation of state and demonstrated that it can be used to calculate the thermal properties of mixtures using group contribution method parameters in collaboration with Professor Gmehling and Professor Rarey (University of Oldenburg) from 2002. We are working on applying SAFT-type equations of state to calculate the thermal properties of more complex mixtures, such as ammonia and water mixtures, and fluorocarbon and lubricant mixtures.		
③ Numerical simulation for liquid-gas two-phase flow with large density difference in complex boundary We are conducting the research about the numerical simulations of gas-liquid two-phase flow using the lattice Boltzmann method (LBM). It is possible to simulate heat and mass transfer in gas-liquid two-phase flows with large density ratios for low Reynolds number flows. Features of this numerical calculation method include its ability to handle complex boundaries, self-formation of free surfaces, and portability to parallel computer systems. The right figure shows a fluid with randomly distributed densities, which aggregates with other fluids of the same density to form a droplet and liquid film on the wall surfaces. We have conducted the research about numerical analysis of flow in complex channels simulating multi-layer sintered wicks in a heat pipe and bubble behavior considering wall wettability. Currently, we are attempting numerical simulations of water transport within plant xylem by LBM.  Lattice Boltzmann simulation for phase separation		
2. Keywords Numerical simulation of thermal fluids, Thermophysical properties of fluids, Equation of state		
3. Remarks and Websites We conduct a comprehensive range of research and activities, from measuring the thermal properties of fluids to developing equations of state. We are currently preparing to operate a apparatus for the sound speed in liquid measurement and are in the process of tuning the devices. In addition, we are conducting joint research with Saga University on the thermal properties of ammonia, for which demand is expected to grow significantly. Numerical simulation of heat and mass transfer has expanded rapidly with the advancement of computers. We are working on analyzing gas-liquid two-phase flow with large density difference in complex boundary, which has been difficult to calculate until now. researchmap: https://researchmap.jp/yamagch Laboratory: http://www2.mech.nagasaki-u.ac.jp		