## SUMMARY

**Rachmat Subagyo**, *Doctoral Program Mechanical Engineering, Interest of Energy Conversion, Department of Mechanical Engineering, Faculty of Engineering Brawijaya University, February 2018, The Role and Mechanism of Hydrogen Gas Bubbles in the Super-Hydrophobic Characteristic of Taro Leaves (Colocasia esculenta),* Supervisor: I.N.G. Wardana, Co-Supervisor I: Agung Sugeng Widodo, Co-Supervisor II: Eko Siswanto.

*This study uncovers the role and mechanism of hydrogen gas bubbles in the super-hydrophobic characteristic of taro leaves (Colocasia esculenta). The investigation was conducted by using the SEM-Edx analysis, mapping out the selements found in the surface of taro leaves, measuring the droplet contact angle, observing gas bubbles, and detecting hydrogen gas. To find out the role of hydrogen gas bubbles in the super-hydrophobic, hydrophobic and hydrophilic characteristics of taro leaves, a layer of micro/nano mixed ($Mg+Al_2O_3$) particle was made as experimental material.*

*Research result shows that super-hydrophobic characteristic of the taro leaves triggers the formation of great contact angle and high surface energy on the droplet. The sharp texture of the nano on the surface of taro leaves causes the energy of the droplet surface to get higher. As a result, the particle vibrates more randomly – triggering a reaction from $H_2O$ droplet and Mg, K and Ca existing on the surface of the leaves and produces hydrogen gas bubbles. Some bubbles are trapped in the nano gaps on the surface of the leaf and some having high level of stress break through the droplet and are led by the Brown-movement to get out of the droplet.*

*The role of the hydrogen gas bubble in the super-hydrophobic, hydrophobic and hydrophilic characteristics is that it can create a perfect super-hydrophobic characteristic triggered by the collaboration between the sharp nano-particle texture and gas hybrid (Mg: 50%) existing in the grooves. The very sharp peak point of the nano-particle gives a high effect on the surface stress on the droplet while the gas trapped gives pressure on the surface of the droplet that is in contact evenly; so that it becomes super-hydrophobic. It can create hydrophobic characteristic when the volume of the hydrogen gas is increasing as the Mg percentage (50-80%) also increases. Some gas cannot be accommodated any longer and thus bubbles are formed outside the grooves with its diametrical size that is also getting larger. The surface stress of the bubble decreases as the diameter increases. It causes the droplet contact angle to decrease and change the characteristic from super-hydrophobic to hydrophobic. It can create hydrophilic characteristic when the number of the Mg keeps increasing until (80-100%). The amount of the hydrogen gas formed is getting a lot more and the diameter of the bubble formed also gets bigger due to mergers between bubbles making the surface stress weaker. When the surface stress of the bubble is weaker, it affects the contact angle and the surface stress of the droplet that gets decreased. The greater the pressure of the hydrogen gas following the surface stress of the droplet that gets lowered causes the gas to break through the droplet surface stress and change the characteristic of hydrophobic into hydrophilic.*


***Keywords*:** mechanism, hydrogen bubbles, super-hydrophobic, gas hybrid