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DEVELOPMENT OF A CFRP BASED VACUUM ARC THRUSTER FOR A NANO-SATELLITE  
HORYU-IV**Abstract**

Vacuum arc thruster is suitable micro-thruster for small-satellite because it is able to produce appropriate propulsion as well as it is small in size and lightweight. The thrust has been generated by vacuum arc discharge stored as electric power in a capacitor. During this discharge, very high current, around 100-200A, flows in the form of metal vapor jet from a solid propellant (acts as cathode) resulting a thrust to the satellite. From results of ground test, impulse bit of this thruster is measured as Ns with a specific impulse of approximately 1200 s. Solid metal is used as propellant of the vacuum arc thruster. Therefore, propellant tank, associated piping and valves are unnecessary for this thruster system. In this study, Carbon Fiber Reinforced Plastic (CFRP) is considered as propellant and this system does not need any igniter to trigger the arc. This is because electric discharge is passively generated by the interaction of the CFRP surface and surrounding space plasma. This discharge will lead to the generation of vacuum arc. This vacuum arc thruster will be mounted on HORYU-IV, which is going to be launched in 2016. Kyushu Institute of Technology, Japan has been developing small-satellites 'HORYU' in series. HORYU-II, which was launched in 2012, had been developed for demonstration of high voltage technology in the orbit. HORYU-II successfully confirmed 350V generation by high-voltage solar cells at the altitude of 680 km. This proposed vacuum arc thruster needs high voltage for thrust generation and high voltage generation solar cells of HORYU-IV will drive the vacuum arc thruster. This method leads to a system that does not use a DC / DC converter, as well. Therefore, this vacuum arc thruster is free from any complicated elements and far from possible failure. Development of vacuum arc thruster for the small satellite HORYU-IV is under progress and will be reported in the conference.