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A STUDY OF PREDICTION AND VALIDATION OF FEEP CROWN NEEDLE INTERNAL POROSITY FOR SMALL SATELLITES USING CNN(CONVOLUTIONAL NEURAL NETWORK) AND RANDOM FUNCTIONS

Abstract

The recent trend of New Space is a mass production of small satellites (50 100kg) at low cost and in a short period of time, launch them in large numbers, and operate them in constellation. In particular, the need to develop thrusters for small satellites is emerging as orbit maintenance and transition functions are required to provide services based on constellation satellites. In order to generate thrust in space, the design of such thrusters must secure porosity inside the crown needle so that gallium, the fuel of the thruster, can pass through, ionize, and be emitted. In this study, a CAD model was generated based on a random function to predict the passage of gallium inside the crown needle, and the internal passage was predicted by learning with CNN based on the cross-sectional data of the CAD model. Based on these data, an emission test was conducted to verify the prediction method by checking whether ions were emitted.