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Drag Reduction Method using Combination of Hydrophobic and Hydrophilic Coatings HIROTAKA SAKAUE, RYUJIRO SAKAKIBARA, KATSUAKI MORITA, Japan Aerospace Exploration Agency — A new drag reduction method for a moving model in water is presented. This method applies a flow control using a combination of hydrophobic and hydrophilic coatings on the model surface. The flow is passively controlled by changing a chemical property on a model surface. As a preliminary result, a sphere with 2 mm in diameter is used as a basic model. The sphere is dropped in a 1 m height water tube, which has 100 mm in diameter. A flash lamp with 10 ms interval is used to capture the sphere motion at the terminal velocity. The drag coefficients, Cd, of different surface coatings are compared. Hydrophobic coating on the sphere increases drag with Cd of 0.49, while non-hydrophobic coated one shows Cd of 0.44. A sphere with hydrophilic coating gives Cd of 0.42. This tells that the hydrophilic coating on a sphere reduces drag instead of applying hydrophobic coating. In the final version, the time interval of dropping motion will be included. Besides a sphere model, other basic shapes, such as flat plate and cone, will be investigated. For a flat plate and a cone model, a combination of hydrophobic and hydrophilic coatings will be separately applied on a model surface to discuss the efficiency of a new drag reduction method.

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