

**Joint Development of Electric Double-Layer Capacitor Using Aluminum-Celmet  
—Targeting the Automotive Market—**

Meidensha Corporation (President: Junzo Inamura) and Sumitomo Electric Industries, Ltd. (President: Masayoshi Matsumoto) have been jointly working on the development of a new electric double-layer capacitor (EDLC) that uses Sumitomo Electric's porous metal "Aluminum-Celmet" <sup>※1</sup> for the electrodes. The companies are planning to commercialize this EDLC in the fiscal 2015 for the automobile industry, particularly for electric vehicle (EV) and hybrid electric vehicle (HEV) applications.

Meidensha marketed its bipolar EDLC for high-voltage/high-current storage in 2006. The EDLC features a compact size by using bipolar structure and long life with high number of charge-discharge cycles. Drawing on these technologies in this field, Meidensha has thus far developed infrastructural devices such as momentary voltage drop compensators for stable electric supply and regenerative energy storage systems for electric railways. The company has also proactively accelerated its development efforts toward the improvement of device performance and the expanded use of the EDLC.

Sumitomo Electric's "Celmet" <sup>※2</sup> is a porous metal made from nickel or nickel chrome alloy. It features high porosity (up to 98%), as well as high filling, retaining and current-collecting performance when used with an active material. As such, Celmet has recently been adopted as a positive electrode current collector in nickel-hydrogen batteries for hybrid vehicle. In addition to the high porosity feature of Celmet, Aluminum-Celmet offers lightness (the specific gravity of aluminum is about one-third that of nickel) and greater electrical conductivity (or low electrical resistivity, less than half that of nickel). Furthermore, Aluminum-Celmet offers excellent corrosion resistance. These features make it suitable for use in lithium-ion and other rechargeable batteries operating at high charge/discharge voltages. Aluminum-Celmet can also be used for current collectors in capacitors.

Since 2011, Meidensha and Sumitomo Electric have been jointly working on the development of an EDLC making use of the aforementioned features of Aluminum-Celmet. In the development, Aluminum-Celmet is used for the current collector, carbon nanotube<sup>※3</sup> for the active material, and non-combustible ionic liquid<sup>※4</sup> for the electrolyte. This has led to the recent achievement of a 3.4 times higher volumetric energy density<sup>※5</sup>, wider operating temperature range, and higher output density<sup>※6</sup> than the conventional EDLC<sup>※7</sup> that uses aluminum foil, activated carbon, and organic electrolytes.

Meidensha and Sumitomo Electric will continue the joint development, aiming to increase the volumetric energy density by five times from the conventional level. The companies are planning to deliver sample products in the fiscal 2013 and commence mass production in the fiscal 2015 mainly for automotive applications, particularly power assist and power regeneration for EVs and HEVs.

- \*1 Aluminum-Celmet is a trademark of Sumitomo Electric Industries, Ltd.
- \*2 Celmet is a registered trademark of Sumitomo Electric Industries, Ltd.
- \*3 Carbon nanotube: Allotrope of carbon with a cylindrical nanostructure of 0.4-50 nm in diameter. It is divided into a single-walled carbon nanotube and multi-walled carbon nanotube.
- \*4 Ionic liquid: Electrolyte consists only of cations and anions and is in the liquid state at ambient temperature and pressure. Due to its low vapor pressure, high flame-resistance, and inflammability, it is used as an electrolyte of EDLCs and other electrochemical devices.
- \*5 Volume energy density: Term that indicates the amount of energy stored in a unit volume. A larger number represents a larger storage capability.
- \*6 Output density: Term that indicates the amount of output power per unit mass. A larger number represents a larger instantaneous output voltage.
- \*7 Comparison with the conventional EDLC manufactured by Meidensha.

**【Image of the electric double-layer capacitor using Aluminum-Celmet】**



Planned size: 13 x 15 cm  
(The thickness differs depending on specifications.)

**【Aluminum-Celmet】**

