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PERFORMANCE CHARACTERISTICS OF MAGNESIUM-SILVER CHLORIDE BIPOLAR BATTERY

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ABSTRACT

Magnesium-silver chloride sea water activated batteries are used by Navy for various under-water applications. This cell system possesses high power density, quick activation time, long shelf-life and very good low-temperature characteristics. In the present paper the performance characteristics of 10V/3Ah magnesium-silver chloride bipolar battery are presented.

Key words: Sea water activated battery; Mg-AgCl battery

INTRODUCTION

Since 1946 magnesium-silver chloride [1] reserve battery system employing sea water as electrolyte has been in use for various naval applications. This cell system possesses long shelf-life in the unactivated state because of the physical separation of the electrodes and electrolyte and is capable of being activated in less than a second to deliver the desired power output. Among the various cathodes used in magnesium sea-water activated batteries, silver chloride possesses the highest energy density and power density per unit weight and volume. The high cost of this battery is nullified by the high reliability of the battery system for strategic applications. Magnesium-silver chloride battery has been widely used for various naval equipments like sonobuoy, lifebuoy, life raft, life jacket, torpedo etc.

This performance characteristics of 1.5 v/3 Ah and 1.5 v/5 Ah capacity magnesium-silver chloride cells have already been reported in the earlier paper [2]. In the present paper, the discharge data of 10 V/3 Ah Mg-AgCl bipolar battery are presented.

EXPERIMENTAL

Magnesium-silver chloride batteries of 10 V/3 Ah capacity are fabricated using AZ 31 magnesium alloy plate as anode and sintered silver chloride electrode [3] as cathode. Each battery consists of 7 cells connected in series. Thin plastic wires are used as separators. The batteries are provided with small openings both at the top and bottom for the free flow of electrolyte for the removal of the waste reaction products and for the escape of hydrogen gas evolved during discharge. The loss of capacity due to leakage current in the bipolar cells is reduced by proper sealing of the edges of the cell and minimising the inter-electrode distance. The battery is activated by flooding the battery with sea water and discharging at a constant load of 28 ohms. The discharge is continued till the battery reached 9 V.

RESULTS AND DISCUSSION

The activation time which was measured by oscilloscope was less than 500 milliseconds. The discharge behaviour of 10V/3Ah Mg-AgCl battery is shown in Fig. 1. From the figure it is clear that the battery voltage remains almost constant throughout the discharge. The battery gave more than 8-1/2 hours of service at current drain of 350 ± 20 mA. There is no fluctuation in the working voltage. The noise disturbance as measured by oscilloscope was negligible. The characteristics of the battery are presented in Table I.

Table I: 10 V/3 Ah Mg-AgCl bipolar battery

Size 6 x 8 x 4.5 cm	
Weight	395 g
Working voltage	10 V – 9 V
Time of activation	Less than 1 sec
Watt hour capacity:	
(a) per unit weight	70 Wh/kg
(b) per unit volume	120 Wh/lit

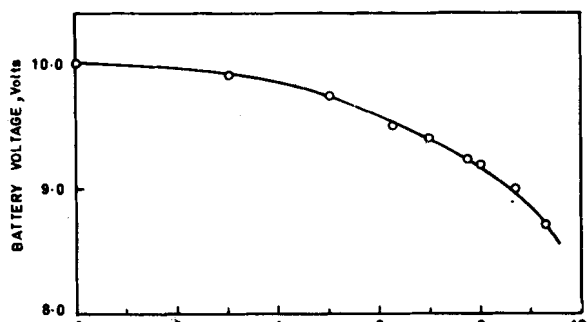

Fig. 1: Discharge characteristics of 10 V/3 Ah Mg-AgCl bipolar battery

CONCLUSION

From the results obtained it may be concluded that this battery of 10 V/3 Ah may be suitable for sonobuoy application.

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