

# NTIS Alert<sup>®</sup>

## Government Inventions for Licensing

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### Chemistry

#### Hybrid Electrochemical Energy Source

C. J. Patrissi, E. G. Dow, and M. M. Medeiros.  
Department of the Navy, Washington, DC. Filed 5 May 05, 13p, ADD020213. This Government-owned invention available for U.S. licensing and, possibly, for foreign licensing. Copy of application available NTIS. Product reproduced from digital image.

**PAT-APPL-8-121 711WGI** Price code: PC N03/MF A04

It is a general purpose and objective of the present invention to establish an electrochemical energy source for use in an underwater environment that utilizes the hydrogen byproduct of a lithium anode battery, such as the lithium water battery, and by doing so increases the coulombic efficiency of the lithium anode battery and eliminates the noise associated with venting the hydrogen, resulting in a quiet operation energy source with high energy density. This objective is accomplished by combining a lithium water battery with a proton exchange membrane fuel cell. The reaction between the lithium and water in the battery will generate electrical energy and hydrogen (H<sub>2</sub>) gas. The hydrogen gas will then be collected and used as the fuel component for the proton exchange membrane fuel cell. The resulting hybrid electrochemical energy source has a low current density, long endurance, and a higher energy density for the entire system over the sum of its individual components.



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Prepared by the National Technical Information Service  
U.S. Department of Commerce, Technology Administration, Springfield, VA 22161 (703) 605-6000

# NTIS Price Schedules

NTIS frequently uses price codes to indicate the cost of items sold. The following schedules convert these codes into actual prices.

## For Customers within the U.S., Canada, and Mexico

### Microfiche & Paper Copy Reports

Standard Prices		Archival Prices		Exception Prices	
A01*	\$ 9.50	\$ 12.00	E01	\$ 18.50	
A02*	\$ 14.00	\$ 17.50	E02	\$ 23.00	
A03	\$ 26.50	\$ 33.50	E03	\$ 25.50	
A04	\$ 29.50	\$ 37.00	E04	\$ 30.00	
A05	\$ 31.50	\$ 39.50	E05	\$ 33.50	
A06	\$ 34.00	\$ 42.50	E06	\$ 37.00	
A07	\$ 38.00	\$ 47.50	E07	\$ 41.50	
A08	\$ 41.50	\$ 52.00	E08	\$ 46.00	
A09	\$ 47.50	\$ 59.50	E09	\$ 51.00	
A10	\$ 51.00	\$ 64.00	E10	\$ 55.50	
A11	\$ 54.50	\$ 68.50	E11	\$ 60.00	
A12	\$ 59.00	\$ 74.00	E12	\$ 66.00	
A13	\$ 62.50	\$ 78.50	E13	\$ 70.50	
A14	\$ 64.50	\$ 81.00	E14	\$ 76.00	
A15	\$ 67.00	\$ 84.00	E15	\$ 82.00	
A16	\$ 69.00	\$ 86.50	E16	\$ 90.00	
A17	\$ 71.50	\$ 89.50	E17	\$ 98.00	
A18	\$ 75.50	\$ 94.50	E18	\$ 105.00	
A19	\$ 78.00	\$ 97.50	E19	\$ 116.50	
A20	\$ 80.00	\$ 100.00	E20	\$ 133.50	
A21	\$ 82.50	\$ 103.50			
A22	\$ 89.00	\$ 111.50			
A23	\$ 91.00	\$ 114.00			
A24	\$ 93.50	\$ 117.00			
A25	\$ 95.50	\$ 119.50			
A99	Contact NTIS				

\* A01 for standard microfiche is \$14.00; \$17.50 for out-of-print microfiche.

\* A02 for standard microfiche is \$20.00; \$25.00 for out-of-print microfiche.

### Computer Products

D01	\$79.00	T01	\$ 246.00
D02	\$129.00	T02	\$ 336.00
D03	\$201.00	T03	\$ 500.00
D04	\$281.00	T04	\$ 664.00
D05	\$360.00	T05	\$ 816.00
D06	\$426.00	T06	\$ 960.00
D07	\$519.00	T07	\$1,132.00
D08	\$584.00	T08	\$1,297.00
D09	\$651.00	T09	\$1,449.00
D10	\$743.00	T10	\$1,600.00
D11	\$810.00	T11	\$1,752.00
D12	\$902.00	T12	\$1,916.00
D13	\$981.00	T13	\$2,068.00
D14	\$1,060.00	T14	\$2,233.00
D15	\$1,127.00	T15	\$2,397.00
D16	\$1,193.00	T16	\$2,549.00
D17	\$1,272.00	T17	\$2,688.00
D18	\$1,351.00	T18	\$2,865.00
D19	\$1,431.00	T19	\$3,017.00
		T99	Contact NTIS

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A04	\$ 59.00	\$ 74.00	E04	\$ 60.00	
A05	\$ 63.00	\$ 79.00	E05	\$ 67.00	
A06	\$ 68.00	\$ 85.00	E06	\$ 74.00	
A07	\$ 76.00	\$ 95.00	E07	\$ 83.00	
A08	\$ 83.00	\$ 104.00	E08	\$ 92.00	
A09	\$ 95.00	\$ 119.00	E09	\$ 102.00	
A10	\$ 102.00	\$ 127.50	E10	\$ 111.00	
A11	\$ 109.00	\$ 136.50	E11	\$ 120.00	
A12	\$ 118.00	\$ 147.50	E12	\$ 132.00	
A13	\$ 125.00	\$ 156.50	E13	\$ 141.00	
A14	\$ 129.00	\$ 161.50	E14	\$ 152.00	
A15	\$ 134.00	\$ 167.50	E15	\$ 164.00	
A16	\$ 138.00	\$ 172.50	E16	\$ 180.00	
A17	\$ 143.00	\$ 179.00	E17	\$ 196.00	
A18	\$ 151.00	\$ 189.00	E18	\$ 210.00	
A19	\$ 156.00	\$ 195.00	E19	\$ 233.00	
A20	\$ 160.00	\$ 200.00	E20	\$ 267.00	
A21	\$ 165.00	\$ 206.50			
A22	\$ 178.00	\$ 222.50			
A23	\$ 182.00	\$ 227.50			
A24	\$ 187.00	\$ 234.00			
A25	\$ 191.00	\$ 239.00			
A99	Contact NTIS				

\* A01 for standard microfiche is \$28.00; \$35.00 for out-of-print microfiche.

\* A02 for standard microfiche is \$40.00; \$50.00 for out-of-print microfiche.

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D02	\$258.00	T02	\$ 672.00
D03	\$403.00	T03	\$ 1,000.00
D04	\$561.00	T04	\$ 1,328.00
D05	\$720.00	T05	\$ 1,632.00
D06	\$851.00	T06	\$ 1,920.00
D07	\$1,037.00	T07	\$ 2,264.00
D08	\$1,168.00	T08	\$ 2,594.00
D09	\$1,302.00	T09	\$ 2,898.00
D10	\$1,486.00	T10	\$ 3,200.00
D11	\$1,619.00	T11	\$ 3,504.00
D12	\$1,803.00	T12	\$ 3,832.00
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D14	\$2,121.00	T14	\$ 4,466.00
D15	\$2,254.00	T15	\$ 4,794.00
D16	\$2,385.00	T16	\$ 5,098.00
D17	\$2,544.00	T17	\$ 5,376.00
D18	\$2,703.00	T18	\$ 5,730.00
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