IRON POWER: EKING MORE JUICE FROM BATTERIES

1 Many of the rechargeable batteries that power cell phones, laptop computers, medical implants, and hybrid cars contain some of the same electrode technology that was used in Thomas Edison's day. Now, chemists have come up with a modern alternative that could potentially multiply the capacity of such batteries.

2 A battery typically consists of two electrodes—a positive cathode and a negative anode—immersed in a substance through which charged atoms, or ions, can flow. The new technology holds promise for replacing the energy-limiting nickel-based cathode in nickel-metal hydride batteries, says chemist Stuart Licht of the University of Massachusetts in Boston, who led the research. Those are the most popular rechargeable batteries for portable electronic gadgets.

3 Whether powering a gadget or a car, nickel ions in the cathodes of such batteries each capture one electron arriving from the anode. By contrast, the new cathode employs salts of an unusual ionic form of iron—hexavalent or superoxidized iron—that readily accepts three electrons per ion, Licht explains. The more electrons the cathode can accept, the more electricity the battery can supply.

4 Using superoxidized iron in a cathode isn't new. Licht and his coworkers achieved that milestone in 1999 (SN: 8/28/99, p. 141). However, the researchers relied on iron-salt crystals the size of fine sand grains, and the prototype batteries made with these materials weren't rechargeable.

5 Licht and Ran Tel-Vered of the Technion Israel Institute of Technology in Haifa have turned to electrochemical-processing techniques to make grains roughly a billionth the volume of previous ones. With these smaller grains, the scientists created a cathode so thin that incoming electrons can find their way to virtually all of the cathode's ions. Because of that same nanoscale thinness, the electrode can be charged and discharged 200 times, the scientists report in the March 10 issue of Chemical Communications.

6 Although that's less than half the minimum number of recharging cycles expected from a commercial battery, the new work shows that there's no fundamental barrier to designing rechargeable batteries with superoxidized iron, Licht says.

7 "Iron has possibilities," comments Stanford R. Ovshinsky of the company Energy Conversion Devices in Rochester Hills, Mich. Still, the new technology is "far from being a useful battery," notes Ovshinsky, who invented the metal hydride battery about 20 years ago.

8 "What Licht has done is extremely encouraging," says Digby D. Macdonald of Pennsylvania State University in State College. While the new cathode technology is still at an early stage, he adds, "it's certainly one of the most promising cathodes around."

Source: Peter Weiss. (2004, March 20). Science News Online 165 (2), p. 181.
Taken from: http://www.sciencenews.org

Exercises

Signal words.
Find four words/phrases that show comparison/contrast in the text.

Signal word	*Line number*
1. the same (electrode technology)	par. 1, l. 2
2. the most popular rechargeable batteries	par. 2, l. 5-6
3. By contrast	par 3, l. 2
4. roughly a billionth the volume of p.o.	par. 5, l. 2-3

Referents.
Indicate what the following words refer to in the text.

1. *which* (line 6) substance
2. *who* (line 9) Stuart Light
3. *those* (line 9) nickel-metal hydride batteries
4. *their* (line 23) electrons

True / False.
Read the following statements and say if they are True or False. Justify your answers.

F Four types of batteries are being compared in the text. (par. 1, 2)

T/F Batteries still have the same capacity they had in Thomas Edison's days. (par. 1 T-true, F-new)

T There are two electrodes in a battery. (par. 2, line 1)

F The scientists reported their results in Chemical Communications Journal April 10 issue. (par 5, lines 6-7)

Understanding the text.

1. According to the text, the term *gadget* refers to _____.
   a) any small and usually ingenious ~~mechanical~~ device or tool
   b) to recharge an electronic tool
   c) some kind of device used to recharge batteries

2. From paragraph 4, it could be inferred that _____.
   a) the new battery only used very fine iron crystals — implicit (lines 3)
   b) the superoxidized iron in a cathode was used in 1999 — explicit (lines 1-2)
   c) the iron-crystal batteries were rechargeable

3. In paragraph 2, the term being described is _____.
   a) *cathode*
   b) *battery*
   c) *gadget*

I would change this option to "the new battery was rechargeable" (which can be inferred more accurately in fact)