The World Needs To Crack Battery Recycling, Fast

(wired.co.uk)

Posted by msmash on Thursday November 25, 2021 @04:00AM from the closer-look dept.

As batteries start to pile up, carmakers, battery companies and researchers are trying to save them from ending up in landfills. From a report: *Recyclers are primarily interested in extracting the valuable metals and minerals in the cells. Getting to these materials is complex and dangerous: After removing the steel casing, the battery pack needs to be unbundled into cells carefully, to avoid puncturing any hazardous materials. The electrolyte, a liquid whose job it is to move lithium ions between the cathode and anode, can catch fire or even explode if heated. Only once the pack has been dismantled, recyclers can safely extract the conductive lithium, nickel, copper, and cobalt.*

Used in the cathode, cobalt is the most sought-after material used in batteries. In its raw form, the rare, bluish-grey metal is predominantly sourced from the Democratic Republic of Congo, where miners work in perilous conditions. The world's major electric car manufacturers are already moving away from cobalt, deterred by the human rights abuses, shortages in the supply chain. That raises the question of whether recyclers will still find it worthwhile to dismantle newer battery types lacking the most valuable ingredients. "When you move to more sustainable materials, and lower cost materials, the incentive to recycle and recover them diminishes," says Jenny Baker, an energy storage

expert at Swansea University. She likens this to a dilemma in consumer electronics: It is often cheaper to buy a new mobile phone than to get it fixed or recycled.

[...] In a first step, recyclers typically shred the cathode and anode materials of spent batteries into a powdery mixture, the so-called black mass. In the board game analogy, this would be the first slide down on a snake, Gavin Harper, a research fellow at the University of Birmingham, explains. The black mass can then be processed in one of two ways to extract its valuable components. One method, called pyrometallurgy, involves smelting the black mass in a furnace powered with fossil fuels. It's a relatively cheap method but a lot of lithium, aluminium, graphite and manganese is lost in the process. Another method, hydrometallurgy, leaches the metals out of the black mass by dissolving it in acids and other solvents. This method, Harper says, would correspond to a shorter snake in the board game, because more material can be recovered: you fall back, but not by as many squares as when using pyrometallurgy. The process, however, consumes a lot of energy and produces toxic gases and wastewater.

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- **This article was written for five year olds** (Score:1)
  by TheNameOfNick (7286618)
  Unfortunately the people who would appreciate board game snake analogies aren't interested in your opinions on raw materials. S
  - **R** ( )
    by
    You seem to have the reading ability of a 5 year old - she was actually quoting someone else who used the analogy.
    The article was rather good and pitched just right for non experts.
- **Re:** (Score:2)
  by TheNameOfNick (7286618)
  I'm not surprised you liked the article. It has board game snakes.
  - **Re: This article was written for five year olds** (Score:2)
    by IdanceNmyCar (7335658)
    That whole analogy made zero sense to me. The whole point of the game is to make the snake longer...
- **Money down the drain** (Score:2)
  by AmiMoJo (196126)
  Who is throwing batteries into landfill? That's money down the drain, those cells are worth quit a bit today. Have a look on sites like eBay and AliExpress, there are loads of used cells that people recycle. You can buy either the cells on their own or cells that have been tested and built into packs.
  Recycling is already a huge business.
  - **Re:** (Score:2)
    by Tx (96709)
    That's re-use, not recycling, at least in the context of TFA.
    Yes, you can re-use cells for a while beyond their prime, but eventually they get to the point of having zero usable capacity, and at that point they need to be scrapped or recycled for their materials, which is what the article is talking about. And the point of the article is that with the number of EVs on the road growing rapidly, so will the number of batteries getting to that point, and we are not currently anywhere near equipped to recycle

- **Re:** (**Score:2**)
  by geekmux (1040042)
  Who is throwing batteries into landfill?
  We *used* to recycle aluminum cans, back when the metal was worth *far less*.
  We *used* to charge deposits for glass, and people *used* to actually return the glass for that deposit. It's amazing that isn't worth the effort anymore, but risking you life for a click or a like online somehow is. *"Go collect bottles kid...you'll live longer."* wasn't advice the older generation thought they would ever *need* to give out.
  Human starvation is still a pretty big thing, and yet how many metric tons of consumable food are th
- **Ni-Fe batteries are almost not problematical** (**Score:2**)
  by Thorfinn.au (1140205)
  https://en.wikipedia.org/wiki/Nickel%E2%80%93iron_battery
  The metals are nickel, which is mined in Australia, Canada, New Caledonia (part of France), and iron (most of the planet).
  *quoting wikipedia*The nickel–iron battery (NiFe battery) is a rechargeable battery having nickel(III) oxide-hydroxide positive plates and iron negative plates, with an electrolyte of potassium hydroxide. The active materials are held in nickel-plated steel tubes or perforated pockets. It is a very robust battery which is to
  - **Re: Ni-Fe batteries are almost not problematical** (**Score:2**)
    by IdanceNmyCar (7335658)
    Where does the article mention Ni-Fe batteries? Even your quote refers to how they are not used in most modern systems.
    - **Re:** (**Score:2**)
      by Thorfinn.au (1140205)
      Priced at about the same (energy storage basis) as lithium and last twice as long.
      - **Re: Ni-Fe batteries are almost not problematical** (**Score:2**)
        by IdanceNmyCar (7335658)
        Again that's not the point? Energy density is what people care about though it seems like these batteries are still decent for maybe a UPC or small in-house solar grid.
        - 1 hidden comment
        - **Re:** (**Score:2**)
          by Thorfinn.au (1140205)
          They are good for adding to your house solar system, but terrible for a car of phone (use Lithium here). The operational life of 20+ and some have done 50 years is also good for your house and for adding to remote systems to provide charging for a car. The other issue is they are not maintenance free, they need electrolyte top ups monthly/quarterly.
          -
          -
          -
  - **Re:** (**Score:2**)

by Viol8 (599362)
"Due to its low specific energy, poor charge retention, and high cost of manufacture"
Which is why its useless for electric vehicles and no one is using it in them. It might have a place as fixed grid storage but thats about it.

- **Re:** (**Score:2**)
by jenningsthecat (1525947)
https://en.wikipedia.org/wiki/Nickel%E2%80%93iron_battery
I'll see your Wikipedia link and raise you another: https://en.wikipedia.org/wiki/... [wikipedia.org]. According to that chart Lithium Cobalt batteries have more than four times the energy density by volume of the formulation you're championing. Where you have lots of space available - wind and solar installations come to mind - nickel-iron batteries may be viable. In cars? Not so much.
And at a self-discharge rate of 20-30 percent a month, (info from your own Wikipedia link), you'd better make sure your charge level is up

- **Re: Batteries and waste** (**Score:2**)
by IdanceNmyCar (7335658)
The difference is the pollution for fossil fuels has relatively no end. The economics of carbon capture to reusable fuel is worst than battery recycling but scarcity hasn't yet driven us to innovate enough. The pollution from this industry can be nullified far before we can reverse the damage from greenhouse gas emissions.

- **Proves the old saying** (**Score:1**)
by Circlotron (764156)
You can't unscramble an egg. Or a battery, so it seems.

- **Decent public transport is part of the solution** (**Score:2**)
by Viol8 (599362)
In most big cities in europe public transport is good (this doesn't apply to most of them in north america). Outside of the cities - not so much , so anyone living in a rural area or small town currently has little choice but to use a car as there's little to no bus service and the nearest station is miles away. Sort out decent PT and you could reduce car usage and hence pollution by an enormous amount. Yes it'll require subsidy but some things matter more than profit.

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