QUANTUM GLASS BATTERY

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INTRODUCTION

This new battery replaces the liquid electrolyte normally found in Lithium-Ion batteries, with this special glass to create a completely solid battery. Unlike the liquid electrolyte found in lithium batteries, it is not flammable, and there is no danger of explosion.

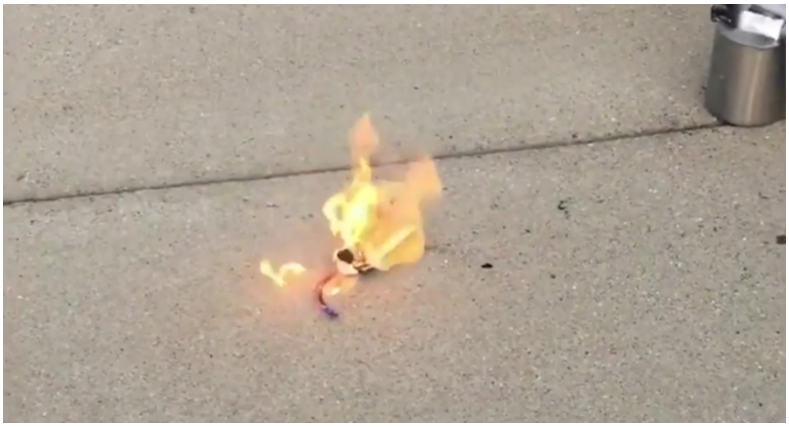

Figure 1. Li ion battery fire in air.

Figure 2. Li ion battery car fire.

Even though it is solid, its new material has as much as 27 times more surface area than its liquid counterpart, allowing more ions to pass through it, at a much faster rate. The result is that it stores more energy in less space,

Figure 3. Exterior of quantum glass battery.

Figure 4. Interior of quantum glass battery.

glass type	composition (mol%)	density (g/cm^3)	T_g (°C)	ΔT^a (°C)	refractive index at 1064nm
TZNL	73 TeO_2 – 20 ZnO – 5 Na_2O – 2 La_2O_3	5.35	315	165	2.00
TZN	75 TeO_2 – 15 ZnO – 10 Na_2O	5.15	293	171	1.98

[a] Crystallisation stability defined as difference between onset of glass crystallization and glass transition temperatures [14,15].

Figure 5. TZNL and TZN Glass composition.

It drastically increases charging speed and requires almost no rare or expensive materials and therefore, is much cheaper to make.

As glass, it does not degrade like today's liquid electrolyte does. It can be recharged multiples times without losing energy density.

Charging Time

It takes 75 minutes to fully charge the lithium-ion batteries inside a Tesla. That is not very practical in today's fast-paced world. The Quantum Glass Battery's preliminary testing showing a charge time as fast as 60 seconds.

Cruising Range

The technology behind Quantum Glass Battery promises to take you as far as 1,000 miles before it needs to be charged again — enough to overcome even the most severe case of range anxiety.

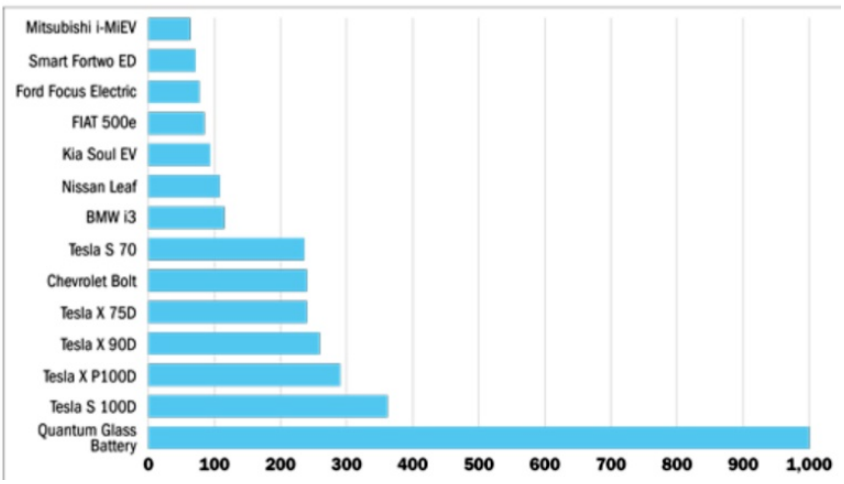

Figure 6. Range of different batteries.

Battery Lifetime

Constant charging and discharging slowly erodes the performance of today's lithium-ion batteries. The Quantum Glass Battery can go through multiple charge cycles before beginning to lose energy capacity.
Safety.

DISCUSSION

A hurdle the Quantum Glass Battery must overcome before it can go on to drive the mainstream adoption of electric vehicles is cost. With the average cost of electric cars still north of $50,000, they are simply too expensive for the average American.

However, the first gasoline cars were ready for road use as early as 1885, but were way too expensive for the average consumer, until Henry Ford's adoption of the assembly line several years later that automobiles to be produced cheap enough to be sold on a mass scale.

The battery makes up as much as 40% of the production cost in electric cars. When the first electric vehicles were introduced in 2010, for example, lithium battery packs cost an average of $1,000 per kilowatt-hour (kWh) to produce. At that rate, the average retail price of an electric car runs about $80,000.

The "holy grail" for companies has been to get that cost down to $100 per kWh., which is the critical tipping point at which electric car prices can become competitive with gasoline-powered cars. By 2017, improvements had been made to lithium batteries

that pushed costs down to around $200 per kWh. The Quantum Glass Battery may cross the $100 threshold.

A standard lithium-ion battery has 18 different steps in the manufacturing process and takes 50-60 days to produce. The Quantum Glass Battery can be produced in a fraction of that time, as little as 10 days—and could give us the first ever $15,000 mass-market electric car.

REFERENCE

1. Kevin Bullis, “A Guide to Recent Battery Advances,” Technology Review, June 29, 2010.