

The Present Status and Road Map of Developing EV and Advanced Lithium Batteries in China

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Regarding to big issues of CO₂ release and oil consumption with very fast increase of cars & buses, a target to reach holding quantity of above 5 million electrical vehicles in 2020 has been set up in China, based on a newly proposed national automobile & new energy vehicle development plan between 2011 and 2020. Now, the first generation EV & EV battery technology with 80Wh/kg in system level is in the wider demonstration & evaluation and new R & D projects of EV and advanced lithium batteries with target of 150-250Wh/kg are being carried out.

Chinese development strategy on electrical vehicles

China has become the largest vehicle producing country in the world, since 2009, when the output of vehicles reached 13.6 million sets. Furthermore, it reached more than 18 million sets in 2011. In this case, total oil consumption is much increased year by year. In particularly, oil import is greatly increased from 29.1% of total oil demand in 2006 to more than 50% in 2010. It is predicted that vehicle holding quantity will reach about 200 million sets and oil import ratio will be up to about 70% in 2020, based on present status. Obviously, CO₂ released from vehicles is more and more seriously, due to such fast increase of vehicles. Therefore, China government is very concerning in energy safety & environmental protection and makes their many efforts to develop both energy conservation & new energy vehicles in past years. But, among those, electrical vehicles are being paid more attentions in the development strategy, in particularly during the 12th Chinese National Five Year Plan period (between 2011 and 2015). A target to reach holding quantity of over 5 million electrical vehicles in 2020 with adopting some approaches to promote industrialization & commercialization of electrical vehicles and advanced batteries has been set up. Those approaches include “speeding up the key technology development through 863 & 973 programs”: “speeding up market evaluation & infrastructure construction through large scale demonstration programs” and speeding up sales to personal users through some financial subsidy policies, etc.

Chinese 863 project on developing electrical vehicles and advanced batteries

The electric vehicle project in Chinese National 863 Plan strongly supported by China Ministry of Science & Technology is implemented by aligning three different types of EVs so called “Three Vertical” (Fuel Cell EVs, Hybrid EVs and Pure EVs) and their major common systems so called “Three Parallel” (Power train, Energy Sources and their management system and Control System), as shown in Fig.1. Obviously, R & D of advanced battery is a key part of the whole project, which has been carried out for two “five year plan” periods. Up to now, high safely Li ion cells, modules and packs have been developed and reached 110-120Wh/kg, 100-110Wh/kg and 80-90Wh/kg, respectively. Typically, Li ion battery pack with LiFePO₄ positive material shows long cycle life both at +25, as shown in Fig. 2. Also an E-bus powered by a LiMn₂O₄ battery pack has run more than 100 thousand km within over 3 years in Beijing.

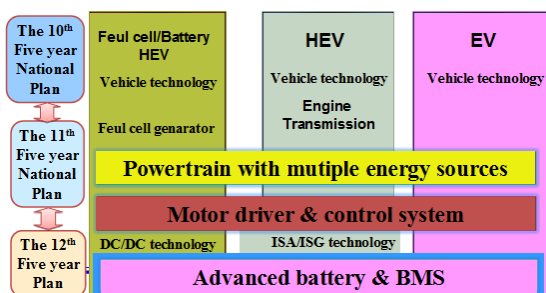


Fig.1 The concept of “Three Vertical” and “Three Parallel” development plan

Furthermore, development of Li ion battery systems with higher energy density (150-250Wh/kg) and/or higher power density as well as lower cost (1.5RMB/Wh), etc for PHEV & EV applications will be emphasized & supported within the 12th Chinese National five year Plan period.

Chinese large scale demonstration programs on electrical vehicles

In order to speed up practical evaluation & infrastructure construction (such as charge stations, etc), state government proposed a three-year long “13city/1000Vehicles each” Large Scale Demonstration Program in selected cities (In fact, it extends to 25 cities, now). New energy vehicles are firstly applied in public transportation system and subsidy from government to operation department is available to offset the price difference between new energy vehicle and traditional vehicle. Based on the plan, there will be totally more than 120 thousand new energy vehicles purchased and demonstrated in those selected cities and in next three years. It is believable that advanced Li ion batteries will be dominated in most EVs and PHEVs. For examples, 60 E-buses with 140kWh Li ion batteries were running, every day in the Shanghai EXPO and totally sum of 3 million km has already reached. In Shenzhen 50 pure EV taxi (E6) in the service and totally 108 sets private cars (F3DM PHEV) are sold by end of 2010. Also many charge stations are being built up.

Road map of Chinese EV & advanced lithium battery technology and market development as well as battery industry prospect will be more explained & presented in the Symposium.

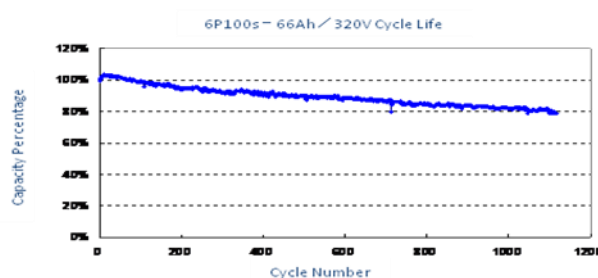


Fig. 2 Typical cycle performance of Li ion cells with LiFePO₄ positive material