

Electric Vehicles Projects of China in the 21st century

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Chinese auto industry is designated as key industry of China but is largely retarded by many reasons. EV is a new high tech product, which provides a chance and challenge to Chinese auto industry.

The national EV key science and technology industrial engineering project was started in 1996. The State Shantou-Nanao EV Demonstration Base District was founded in 1998. The 123rd Fragrant Hill Science Academic Meeting, the official scientific meeting was held in Oct. 1999, discussing the special topic "the Actuality and Future of the Key Technology (Batteries) for industrialization of EV". In October 2001, the Ministry of Science and Technology of China established the EV R. & D as the key project of the National High Technology Research and Development Program (863 Project Program), symbolizing that Chinese EV R. & D has been developing on an across-the-board scale. Meanwhile, the normal 863 Project Program in 2002 had assigned special funds to the EV R. & D.

1 Electrochemists' View of EV Development in China

Battery is the key technology of EV. It is necessary to set up a system matching with the battery for its charging, exchanging, reclaiming and maintaining. Battery should be considered from the very beginning of the design of an assembly vehicle in order to optimize the improvement of the capability, lifetime, arrangement of the power source, the energy transfer matching between chemical power and the motor, controller, and the charging & discharging, monitoring of batteries so that the high performance of EV can be ensured. It is difficult for non-electrochemists to combine various kind of batteries with different characteristics in an optimal way to suit the cars for various usage. Thus, electrochemists must join the planning of EV R & D, the designing, the economic budgeting of EV. In March 2002, in the 9th fifth National Conference of Chinese People's Political Consultative Conference, some members suggested the overtures on that country should allot the fund for EV batteries' R & D, and it is hopeful to be realized in the coming 973 Project Program.

2 Present Status of Kinetic Batteries in China

Lithium batteries have been attracting multitudinous companies or universities. The output of lithium batteries of China is the third in the world. Both the safety and price have been much improved by selecting electrode materials and electrolyte. Lead acid batteries have been much more used in electric bike, motorcycles and EV. Metal hydride batteries still compete with Lithium. By the middle of the 1990s, the Proton Exchange Membrane Fuel Cell (PEMFC) technology was selected for the key projects of government during the period of 9th five-year plan. A few of PEMFC stacks of 1 ~ 2 kW, 5 kW, and 25 kW were built. Tsinghua University, Chinese Academy of Sciences made some achievements in the researches of low-Pt-loading electrocatalysts and CO tolerance anode catalysts, carbon cloth materials for use in electrode diffusion layers, and perfluorosulphonic acid membranes for use in PEMFCs. The properties comparison with imports were shown in Figs 1-2.

3 Economic Analysis of Setting an EV Route in Beijing

Buses are chief vehicles for transportation in Chinese

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cities. We suggested the Project of Setting an Electric Bus Special Route in Beijing. The YW6120 DD is selected for the project, which is 12 m long, high power electric heavy bus made in China, having 50 seats for 100 passengers.

The investment comprises the item of battery groups, the overall buses, the other fixed asset; and the prophase investment (estimated for 2 month need) for the special route commercial running, total expense of four items. The special route commercial running have to begin at the end of one and a half year after the project started, the income is estimated after one year of the commercial running. The battery group and intelligent charging facilities should be concerned as exhausted materials. When the improved type ellipse tubular lead-acid battery group is used as the power source, the fair profit could be got. The running of Tsinghua campus EV proved our estimation to be true.

4 Conclusions and Prospect

EV is a vast social systematic engineering; the support of government is indispensable. EV engineering is multidisciplinary, and the bottleneck is battery. Thus, electrochemists must play major role from the beginning of project planning and EV designing as well as a battery supplier. Also, multi-batteries combination including super capacitor is probably the best choice.

5 Acknowledgements

We gratefully acknowledge support of the National Natural Science Foundation of China (No.20073003), the Research Fund for the Doctoral Program of Higher Education of China (No.98000117), the Fund of Postdoctoral Scientific Research of China

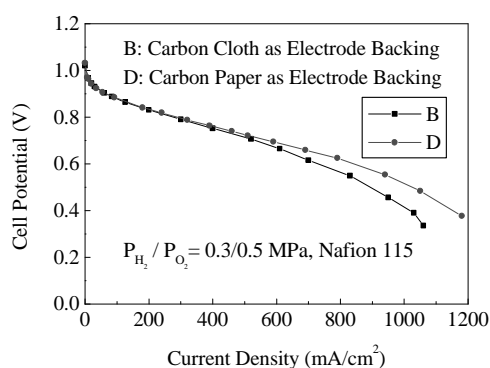


Fig. 1. Comparison of the cell performances between the Chinese carbon cloth and the imported carbon paper.

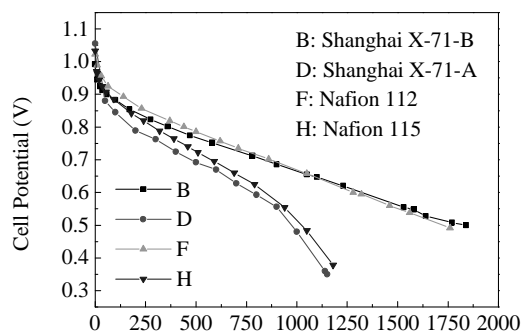


Fig. 2. Comparison of the cell performances of membrane of perfluorosulphonic acid of Shanghai's with Nafion's.