Challenges of PEM Fuel Cell Technology and the Brazilian Fuel Cell Program

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Following the world trend, IPEN started in 2001 a new study area concerning more efficient energy sources that have low environmental impact and therefore it has chosen the study and development of systems associated with fuel cell technology. The initial studies were carried out in the materials area using the previous experience of the nuclear area development. The fuel cell technology has been growing in the last 40 years due to different factors such as the development of the materials area and the growing demand of clean and efficient energy sources. The obstacles to the introduction of the so called "Hydrogen Economy" are not insurmountable. On the contrary, they indicate a list of opportunities for the creation of new enterprises of goods and services in the country, corroborated by the emerging technologies in the sector.

In PEM Fuel Cells the reactions occur in the so called gaseous diffusion electrodes that are an electron-conducting porous structure of the electrode/electron-catalyst system with platinum base. The construction of these electrodes has the function of maximizing the gas-liquid-solid three-phase interface and therefore considerably increasing the electrodic processes velocity. The present R&D development in these type of cells involve nanotechnology in many sectors like: new selective electrocatalysts, new composite materials, besides new components and more economic processes and the optimization of the system engineering.

The main objectives of this institutional program include generation of scientific-technological knowledge, innovation and human resources training in the fuel cell area. The program includes institutional actions, safeguarding the intellectual property concerning technological development and innovation. The focus of the program is on distributed electric energy generation. The program has also the responsibility of participating in the group that defines the Brazilian policy for hydrogen and has intense participation in the organization and operation of the national fuel cell program PROH2. The organization chart of the program is divided in four groups for scientific-technological development, namely PEMFC, SOFC, HYDROGEN PRODUCTION and SYSTEM. Furthermore, IPEN has a post-graduation course in the area with ten disciplines.

Concluding, understanding, characterizing, controlling and improving fuel cell materials and its interfaces, are the central points to achieve maturity of this technology, with competitive costs for each type of specific application. Breakthrough advances are needed in electrocatalysis, membranes (electrolytes) and interconnect materials to achieve commercial status. Brazil is elaborating its roadmap for the "Hydrogen Economy" and has a research and development program for fuel cell and hydrogen. Presently various Brazilian institutions are involved in this sector with several projects in progress. New enterprises have presented products for this new technology (Electrocell, Unitech and Novocell, among others). IPEN has played an important role in the national panorama for the development of this technology. All these considerations permit to say that the "Hydrogen Economy" has already began also in Brazil and it is not merely a matter for the future.

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