The Possibilities: The nanoFLOWCELL® as the Fuel of the Future

Vaduz, 4 March 2014 – The QUANT e-Sportlimousine is a first step towards demonstrating the many advantages of the nanoFLOWCELL®, as well as paving the way for the electrical mobility of the future. Its inventor, Nunzio La Vecchia, has a much grander vision. Environmentally friendly and with an energy density and storage efficiency 5-times greater than conventional flow cell batteries, the nanoFLOWCELL® opens new horizons for applications in the aerospace industry, building power, and more.

The laws of physics have long gotten in the way of simple storage of electricity. Electricity cannot be conserved, only converted into another form of energy. This fact is the basis for the development of complex energy storage systems like multi-level hydroelectric power stations and the discussions around constructing and expanding electrical power transmission networks. Systems that are already in use like lead-acid batteries are in need of great improvements in efficiency and their power-to-weight ratio.

Modern lithium-ion technologies are a satisfactory interim solution for powering mobile telephones or laptop computers. For larger devices, like automobiles, these batteries' behaviour becomes difficult to control to the point of "thermal runaway", that is, the batteries can burst into flame. From this perspective, flow cell technology and its liquid electrolytes could make one of mankind's dreams come true: It is the first time it has been possible to efficiently store meaningful quantities of energy. The outstanding feature of the flow cell system's electrolyte is its stability. It barely degrades at all and remains free from the "memory effect" in both charge capacity and regeneration. Once the electrolyte has been discharged in use, it simply needs to be recharged at an appropriate filling station. 100 litres of used electrolytic fluid can be transformed into 100 litres of ionically concentrated electrolyte, charged and ready to power another vehicle or device.

The biggest advantage of the nanoFLOWCELL® over conventional flow cell technologies is its 5-times greater energy density (600 Wh/kg or litre). For the QUANT e-Sportlimousine, this means its range is 5-times greater at the same weight of previous systems. This also opens the door to many interesting new applications. Furthermore, this newly developed system is safe and reliable to operate whilst being environmentally friendly. In addition, the system contains almost no moving parts, produces little waste heat, and therefore has an operating efficiency of more than 80%. There has never been a system like it.

Today's aeroplanes use a considerable number of batteries on board. The Boeing Dreamliner's batteries are made of the same lithium-ion material as our mobile phone and laptop batteries. This material, in rare cases, is subject to intense thermal collapses. These events are called "thermal runaways", the batteries become extremely hot, melt, and even catch fire. Following two such events, the entire Dreamliner fleet was grounded for several months in 2013 while a desperate search for alternatives and solutions went on. The nanoFLOWCELL® could offer significantly improved energy density and operating safety in aerospace applications.

Energy concepts including nanoFLOWCELL® technology could help railroad transport be more efficient and reliable, giving boost power for acceleration and stabilising on board electrical systems. Passengers might only notice that the quality of WiFi networks on public transit suddenly got better. Use of the nanoFLOWCELL® is also conceivable in next generation drive trains, using it for boost energy and braking regeneration.

Flow cells are already in use for domestic energy storage. They form part of several test programmes for storing solar energy overnight until it is needed for heating, for example. Flow cells could also store electricity generated by wind or other sources. Local energy

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logistic systems for individual residences or small settlements using Redox flow-cells are already being tested in real world conditions. In future, these could allow complete independence from power stations as long as the systems are planned and constructed with sufficient capacity.

The possibilities for new applications and improvements to existing ones seem endless. In the Australian outback, flow-cell technology is already being used to help enable stable energy delivery to communities that previously had to rely on wind power and weak battery stations to power radios and a few light bulbs. Using nanoFLOWCELL® technology, with its 5-times greater energy density, it should be possible to secure energy delivery to such places for periods of days or weeks. The technology could power computers, milking plants, air conditioners, and even local public transit systems. The continued testing and development of the nanoFLOWCELL® is taking these areas into account, just as much as for promoting electrical mobility. It's all about the old dream: simple, lossless, and environmentally friendly energy storage. The nanoFLOWCELL® could make it all possible.

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About nanoFLOWCELL AG

Founded in late 2013, nanoFLOWCELL AG is an innovative Research and Development Centre based in Vaduz, Liechtenstein. The focus of nanoFLOWCELL AG's research is on the advanced development of drive technology and the classification of flow-cell technology. In the simulation laboratory of the nanoFLOWCELL DigiLab in Zurich, mastermind and development chief Nunzio La Vecchia and his team examine important aspects of quantum chemistry on the basis of molecular engineering. For years they simulated experiments with charge transfer, then conducted trials using digital models, before finally synthesising them for further testing. The current research vehicle, the QUANT e-Sportlimousine, enables the developers to study the mechanisms of charge transfer for the innovative storage technology – the nanoFLOWCELL® – during vehicle operation, as well as to fine tune charge strategies for recuperation and further develop the regeneration of cell charging and safety as well as quality controls.