

## Application 2057



### **Online monitoring of biogas composition by a new laser spectroscopic instrument**

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This proposal is a follow-up extension of an EU project currently coming to its end. In the framework of this project, we developed online monitoring systems for the detection of trace components in gases which are destructive to fuel cells. The original analytical instrument is based on Laser-Induced Breakdown Spectroscopy (LIBS), an atomic optical emission spectroscopy which gives access to the sulfur and silicon concentration. While sulfur is directly detrimental to the fuel cell structure, silicon, being present in form of siloxanes, results in silicon oxide deposits reducing the fuel cell's efficiency. Meanwhile, we developed another siloxane detection system, replacing the laser by an electric discharge, which makes the instrument much smaller and cost effective. There are two publications under preparation, each one describing one of these two instruments. Part of the current EU project is also the combination of the LIBS system with a Raman-based biogas analysis. However, the special Raman laser required for this extension, whose development was part of an external subcontract, was not finished until few days ago. Hence, this component will not be finished within the framework of the MCFC-Contex project.

The intention of this project is an extended test of the developed systems at a real-world biogas/FC installation. The instrumentation, apart from the Raman system, are new ready for application. However, in order to bring this part of the MCFC-Contex project to fruition, more applications and test have to be performed at an installation which represents a typical user of such instruments after an envisaged commercialization. The ENEA research center in Casaccia perfectly suits these requirements. Additionally, and equally important, an established reference analysis is available there.

The final aim of this cooperation is to make a further step into the commercial realization of the analyzer developments performed in the MCFC Contex project. Among others, one of the partners of this project, the CETAQUA, expressed a profound interest in establishing the new analytical instruments into their large-scale installations. However, before this step, further intense and long-time performance tests are required in order to identify problems specific to a long continuous operations, such as contaminations of the sampling cells. Furthermore, the Raman instrument, whose development was part of the MCFC Contex project, but could not be completed, will be finished within the next some month. This instrument shall be included into this field measuring campaign.

In order to perform these tests, we apply for a one-month access project, to include 14 days of preparation of the testing facilities and 14 days direct access to the ENEA labs (PEMFC, SOFC, MCFC Fuel cell testing laboratory, ENEA-04) for carrying out the tests and cross-calibration on site. The intended period for these tests is Oct. / Nov. 2014.