The minimum flow rate of the H_2 to ensure proper wettability of the anode is 0.9 Nl/min. The tests will be carried out in the entire operating temperature range.

Once carried out these experimental tests and identified the conditions and compositions that provide the most interesting performances, the tests will be performed for long periods of time in which repeatability can also be verified. Therefore it will be evaluated whether mixtures that offer the best performance are also suitable for continuous operation or whether they will lead to the deterioration of cells, and then a drop in performance.

Given the nature of the materials of the cells that constitute a typical stack, the best performance, both in terms of electrical performance and abatement of carbon deposition, will be obtained at the maximum temperature.

As regards the composition of the mixture feeding, which will give the best results, based on the analysis performed, it will presumably have the following characteristics:

- CO/H_2 ratio of about 20/80 to 35/65, although considering the carbon monoxide as fuel, thereby contributing to electricity generation, but its rate of oxidation is lower than that of hydrogen thus limiting the performance especially at high current density. Moreover, a higher concentration generates carbon deposition;
- N_2 concentration of 30 - 40 %: is able to ensure an appropriate dilution effect, mainly on CO, necessary to prevent the possible deposition of carbon, while still providing a fairly contained drop in performance.
- H_2O concentration of 3 % is considered to be the minimum value to be observed to keep the cell wettability. Actually, case by case, the minimum value is to be simulated and acted on in order to prevent carbon formation.

Although all the parameters considered have a significant effect on the performance of SOFC, the factor of greatest interest on which to focus research is the CO/H_2 ratio. This factor must be assessed scrupulously since it affects the useful life of the cells, as the accumulation of carbon deactivates the reaction surface definitively.

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NOMENCLATURE

WGS	Water Gas Shift reaction
rWGS	Reverse Water Gas Shift reaction
Mix	mixture
i	current density, A/cm^2
V	voltage, V
dP	power density, W/cm^2
YSZ	Yttria-Stabilized Zirconia
p	pressure, atm
T	temperature, °C or K
f	molar fraction
m	mass flow rate, kg/sec
U_f	fuel utilization factor
F	Faraday constant, C/mol

Greek symbols

α	carbon deposition parameter
η	Electrical efficiency

Subscripts

max	maximum
opt	optimum