

Production of Nanostructured Carbon Materials and Hydrogen by Microwave Plasma at Atmospheric Pressure

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During the last decade, arc discharge [1], laser ablation [2], chemical vapor deposition [3], plasma-enhanced CVD [4] and thermal decomposition on SiC techniques have widely been used for the synthesis of both graphene and CNTs. However, the techniques above mentioned require the use of harsh conditions and metals as substrates, thus increasing the production costs.

In the present research, we would like to present a free-substrate synthesis of both nanostructured carbon materials and molecular hydrogen by surface microwave plasma at atmospheric pressure using alcohols as carbon and hydrogen sources. The system designed by our group is shown in Figure 1. With this new patent-protected technique neither other supplementary chemical process nor metallic catalyst are needed. The technique reported here, allow us to obtain two products with high added value.

Hydrogen production was identified and quantified connecting a mass spectrometer to the gas exhaust stream coming from ethanol pyrolysis. High Resolution Transmission Electron Microscopy (HRTEM) and Raman Spectroscopy were used to characterize the carbon material obtained.

Optical Emission Spectroscopy (OES) was used for on-line control of the radical formation processes from the alcohols decomposition into the plasma. Plasma emission spectrum showed the formation of C and C₂ species which are considered as the precursors for formation of nanostructured carbon materials [5].

References

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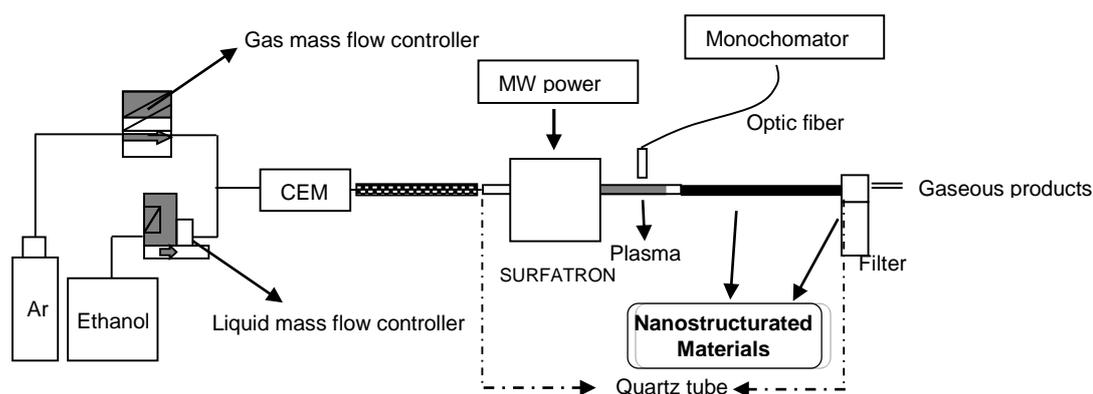


Figure 1. Experimental setup.