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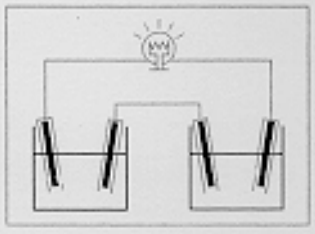

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[P2A.1]

Membrane Electrode Gasket Assembly (MEGA) technology for polymer electrolyte fuel cell

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Thanks their high power-density performance at low temperature (70÷90°C), PEFCs are very promising as energy sources for electric vehicles. Nevertheless the cost of a PEFC stack is still prohibitive for a massive production and the introduction of low-cost materials and/or process are necessary to reduce it. Moreover industrial production need a quality control to guarantee that every PEFC stack will have well defined performance. A variety of drawbacks are connected to the development of PEFCs: a) difficulty in guaranteeing the gas seal increases as the number of individual assemblies grows; b) three operations for each individual cell are foreseen for assembling the stack: positioning the gasket, positioning the MEA and positioning the second gasket; c) there is a waste of membrane because the membrane area that overhangs the electrode is not used for the ionic exchange since it is intended for connection with the gaskets. The technology showed in this work, named MEGA (membrane electrode gasket assembly), has the purpose of eliminating, in principle, these drawbacks by devising a "drowning" process of the MEA in the gasket, according to a known process of material injection moulding. A device that is characterised by being basically made up of a MEA assembly, without overhanging membrane, attains this purpose. A bi-component silicon based liquid mixture is injected, in a special mould, directly on the perimeter of each MEA, in this way creating the MEGA. The MEGA technology shows several advantages respect to traditional PEFCs stack assembling system: effective membrane saving, reduced production time, quality control and failed elements substitution. MEGA technology was successfully tested at the ENEA laboratories (fig.1). MEGA technology offers several advantages respect to traditional assembling system: (i) effective PEM saving (cost reduction): membrane it is not used as a gasket coupling surface, but is only used in the active area; (ii) production time reduced: the MEGA preparative and its insertion/extraction in the fuel cell stack are quick and easy; (iii) quality control: the MEGA system can be characterised in a single fuel cell configuration and stored before the utilization in a stack, maintaining its performance; (iv) failed elements substitution: it is possible to disassemble the stack, replacing only the failed cell. MEGA can be reused several times without any change or decrease of performance.

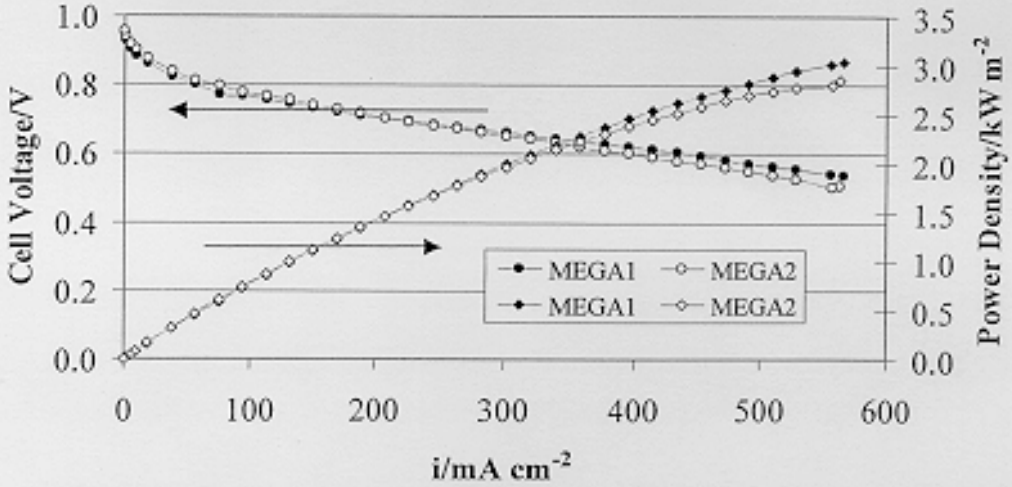

Fig.1 – MEGA performance at the following operative conditions: Tcell=75 °C, Tan=83 °C, Tcat=60 °C, H2/air=1.1/1.1 bara, cathode SR=2, anode SR=3.