applied to the platinum meander. One process uses a binder, colloidal silica or silica sol, which is effective at high calcination temperatures (900–1000° C.) the other two processes use glass frit and an alina precursor, both of which are effective at lower calcination temperatures (600–800° C.).

In the first process, the binding agent is an aqueous colloidal dispersion of 15 to 30 wt % content and 8nm silica particle size. This is added to the dry base material of both the active and reference elements and mixed to form a stiff paste, which is suitable for printing through a stencil or a screen with square openings of 0.35–0.45 mm per side. The stencil yields alumina layers of 100 micron thickness, while it is possible to obtain layers of 20–30 micron thickness after sintering when using a screen, resulting in a reduced load on the free-standing sensors.

After these processes, binding is accomplished by slowly heating the detectors in air to a maximum temperature of 900–1000° C. and slowly cooling them down again. Low temperature binding processes have definite advantages, such as the reduced loss of surface area and reduced thermal stresses.

In the second process, which can be used for low temperature binding and which contains an inorganic binder, 5–20 wt % glass frit is used. 12% wt glass frit is preferably used in the process of the invention to obtain maximum strength and minimum interference with catalytic activity. The glass frit is milled with alumina for one hour to obtain a mixture in which the frit is of fine particle size and is well distributed.

The powder is then calcined above 400° C. (which is above the glass transition temperature) for an hour to allow a certain amount of reaction between the glass frit and the alumina to take place.

Terpineol, an organic solvent with a high boiling point, combined with ethyl cellulose, is used as a medium to obtain a paste of the correct viscosity for screen printing.

The same steps as in the first process are used to apply the alumina mixture to the free-standing platinum meander, with the exception that terpineol and not water is used to adjust the viscosity as necessary. After application the sensors are dried and calcined at a temperate of 600–800° C. in air.

In the last process for the low temperature binding of alumina, the alumina is calcined with an alumina precursor and an acid. Activated alumina is mixed in a ratio of two parts by weight to one with an alumina precursor, such as aluminum nitrate, with the addition of 1 wt % or less of acetic acid. The acid acts as a pelting agent. Enough water is added to give either a screen printing paste of the correct viscosity, or a slurry for applying small drops to the free-standing meanders. Calcination is performed in air for 3 hours at 750° C. The surface area after calcination is in excess of $200m^2g^{-1}$ if a high surface area activated alumina is used as the starting material. Gradual warm up (100° C. per hour or less) and slow cool down is a feature of the heat treatment or calcination step in all binding processes.

The sensors (all three catalyst and carrier combinations) were found to be linear in their reaction to methane concentrations of up to 2.5% in air. It was also found that the sensors are equally suitable for the detection of hydrogen and methane gas at operating temperatures.

For instance, a combination of 0.35% H_2 and 1.05% CH_4 yields the same signal as 1.4% methane in air. The operation of the sensors is also uneffected by the reduction of oxygen concentration from 21% to 13%.

By using the bridging leads as a support for the sensing structure, the simplicity of manufacturing is enhanced. Further, the overall structural strength and flexibility of leads formed from platinum or a similar noble natal results in a more resilient structure than one in which major support for the sensing structure is provided by a relatively brittle $Si0_2$ membrane or the like.

We claim:

1. A catalytic detector for a flammable gas comprising a substrate and a sensing structure suspended from the substrate, the sensing structure including:

a) a heating element;

b) a temperature sensing element in the form of a compact layer-deposited electrically conductive meander terminating in at least two electrically conductive bridging leads extending from the meander to terminal pads supported on the substrate; and

c) a catalytic bead supported by and covering the meander, the catalytic bead and the meander in conjunction defining a monolithic structure;

that portion of the substrate which is directly beneath and alongside the sensing structure and the bridging leads being etched away so as to define a cavity which isolates thermally the sensing structure, the bridging leads having a thickness and cross-sectional profile which allows them to provide substantially complete support for the sensing structure.

2. A catalytic detector according to claim **1** in which the meander is sandwiched and encapsulated between a substrate diffusion barrier layer and a superstrate diffusion barrier layer, the diffusion barrier layers being selected so that they have substantially the same thermal expansion co-efficients as that of the heater element, thereby preventing buckling or twisting of the conductive meander when subjected to thermally induced stress.

3. A catalytic detector according to claim **1** in which the bridging leads extend alongside one another and span across the enter width of the cavity, with the electrically conductive meander and the catalytic bead spanning and being supported by the bridging leads, and each of the bridging leads being connected to separate term pads.

4. A catalytic detector according to claim **3** in which the sensing structure has an H-configuration, with the bridging leads forming the legs of the H and the meander and the catalytic bead forming the cross arm of the H.

5. A catalytic detector according to claim **1** in which the bridging leads have a U- or V-shaped cross-sectional profile.

6. A method of manufacturing a sensing structure for a catalytic gas detector comprising the steps of:

a) depositing a heating and temperature sensing element onto a substrate, the heating and temperature sensing element comprising a compact conductive meander terminating in at least two conductive bridging leads;

b) etching away that portion of the substrate directly beneath and alongside the conductive meander so as to define a cavity over which the conductive meander is suspended, with the bridging leads extending between the conductive meander and terminals on the substrate;

c) preparing a catalyst comprising a noble metal on a refractory carrier by treating the catalyst with a catalyst precursor so as to form a slurry or paste;

d) applying the slurry or paste to the conductive meander so as to form a sensing structure supported by the bridging leads; and

e) calcining the slurry or paste in air.

7. A method according to claim **6** in which the slurry or paste is applied to the conductive meander by screen printing, stenciling, spraying or other thick film techniques.