Abridged version

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High Quality Dielectric Film for 0.35-μm Design Rule Application by O3-TEOS-CVD Using Ethanol Pre-treatment

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Synopsis :
A new surface treatment involving the spin-coating of ethanol on a substrate prior to O3-tetraethylorthosilicate (TEOS) deposition by atmospheric pressure chemical vapor deposition (APCVD) was found to be very effective of improving the gap-filling properties and film quality. The deposited film has a flow-like surface shape, and can be used to fill trenches of 0.3μm width and 1.2μm depth, which could not be filled by conventional O3-TEOS APCVD. The effects of surface treating by some other organic solvents are also reported and a possible mechanism is presented.

The body can be viewed from the next page.

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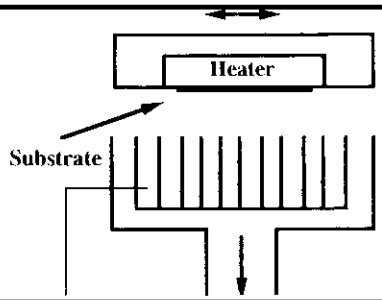
Synopsis:

A new surface treatment involving the spin-coating of ethanol on a substrate prior to O_3-tetraethylorthosilicate (TEOS) deposition by atmospheric pressure chemical vapor deposition (APCVD) was found to be very effective for

the resulting surface irregularities are observed.

2 Experimental

Shown in **Fig. 1** is a process sequence, in which an SiO_2 film to serve as an underlayer is deposited on a 6″ Si substrate, 3 cm^3 of an organic solvent is then dropped on to it after increasing the rotation speed to 2 000 rpm, and spin coating and spin drying (at room temperature)



apparent from (g), showing the surface after gap filling

3 Gap-Filling Properties and Film Quality of

that there are no voids in the O_3-TEOS SiO_2 film and

a plasma TEOS SiO_2 film allows an O_3-TEOS SiO_2 film

other than ethanol a plasma TEOS SiO_2 film deposited as an underlayer on the wiring pattern. Photo 2 (a), the

film, no appreciable improvement is apparent in the gap-filling properties. From these result it was

(a) Non-treatment

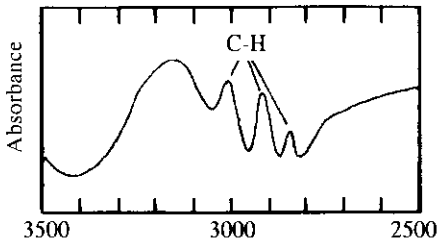
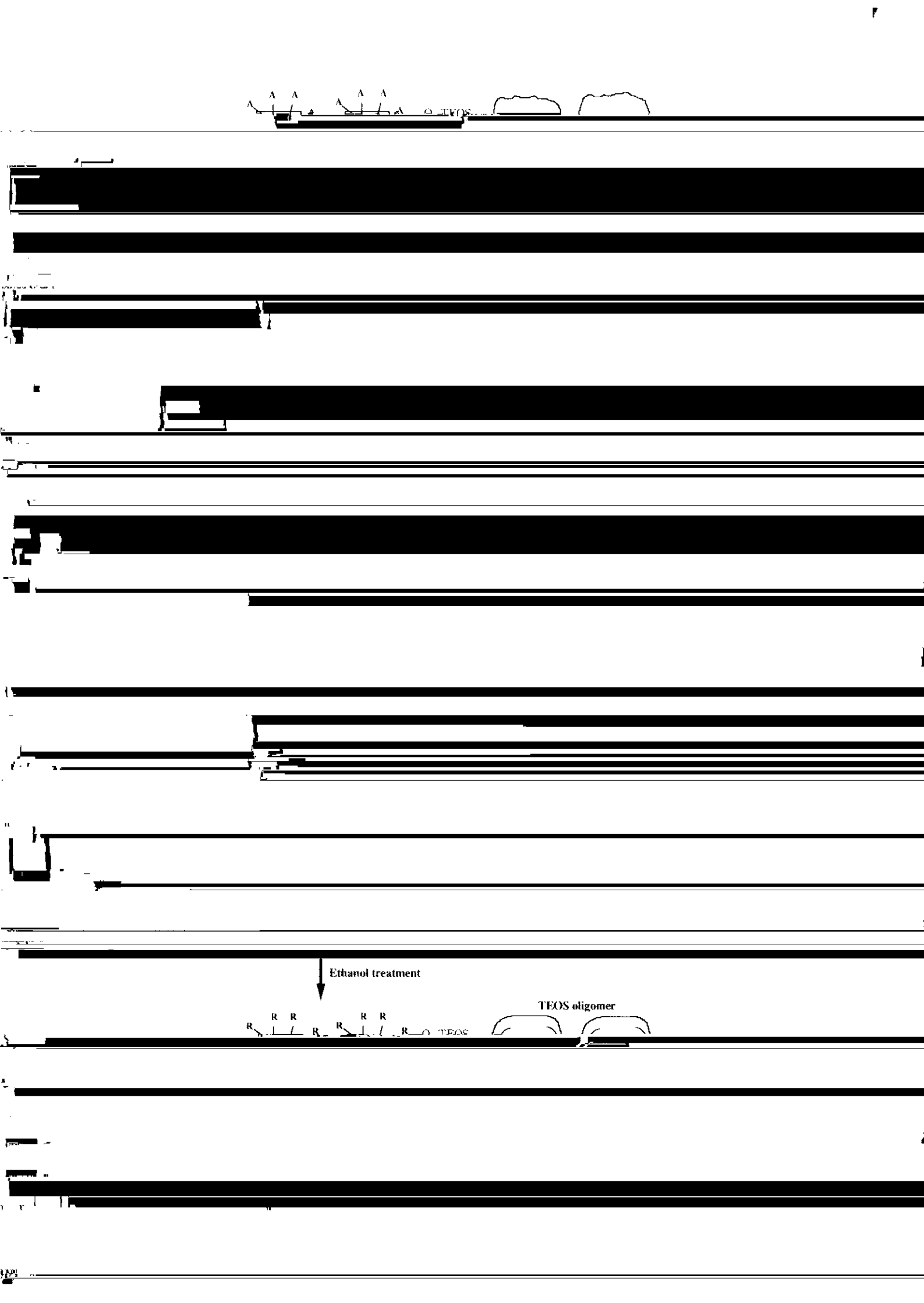


Fig. 3 High-sensitivity reflection FTIR spectrum of


Ethanol treatment
TEOS oligomer