PRIOR ART

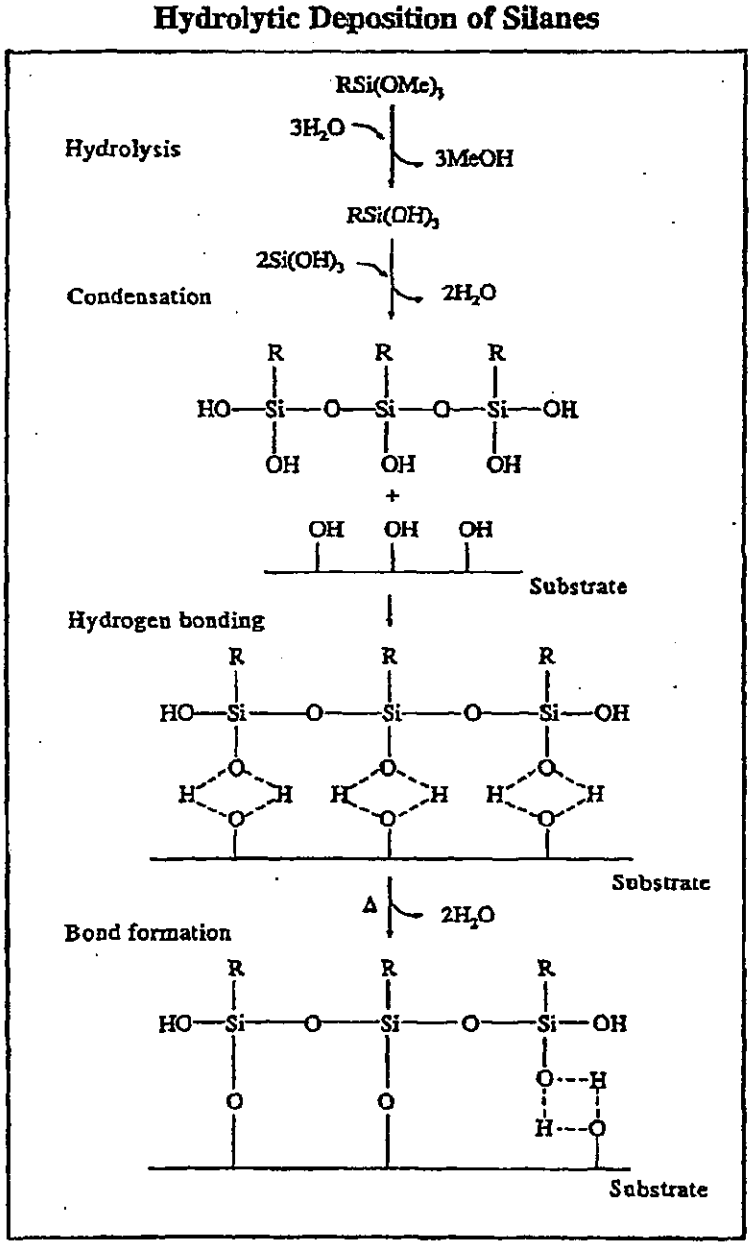


FIG. 1

REACTING SURFACE-BOUND Si-OH GROUPS AND FORMING A HORIZONTAL NETWORK

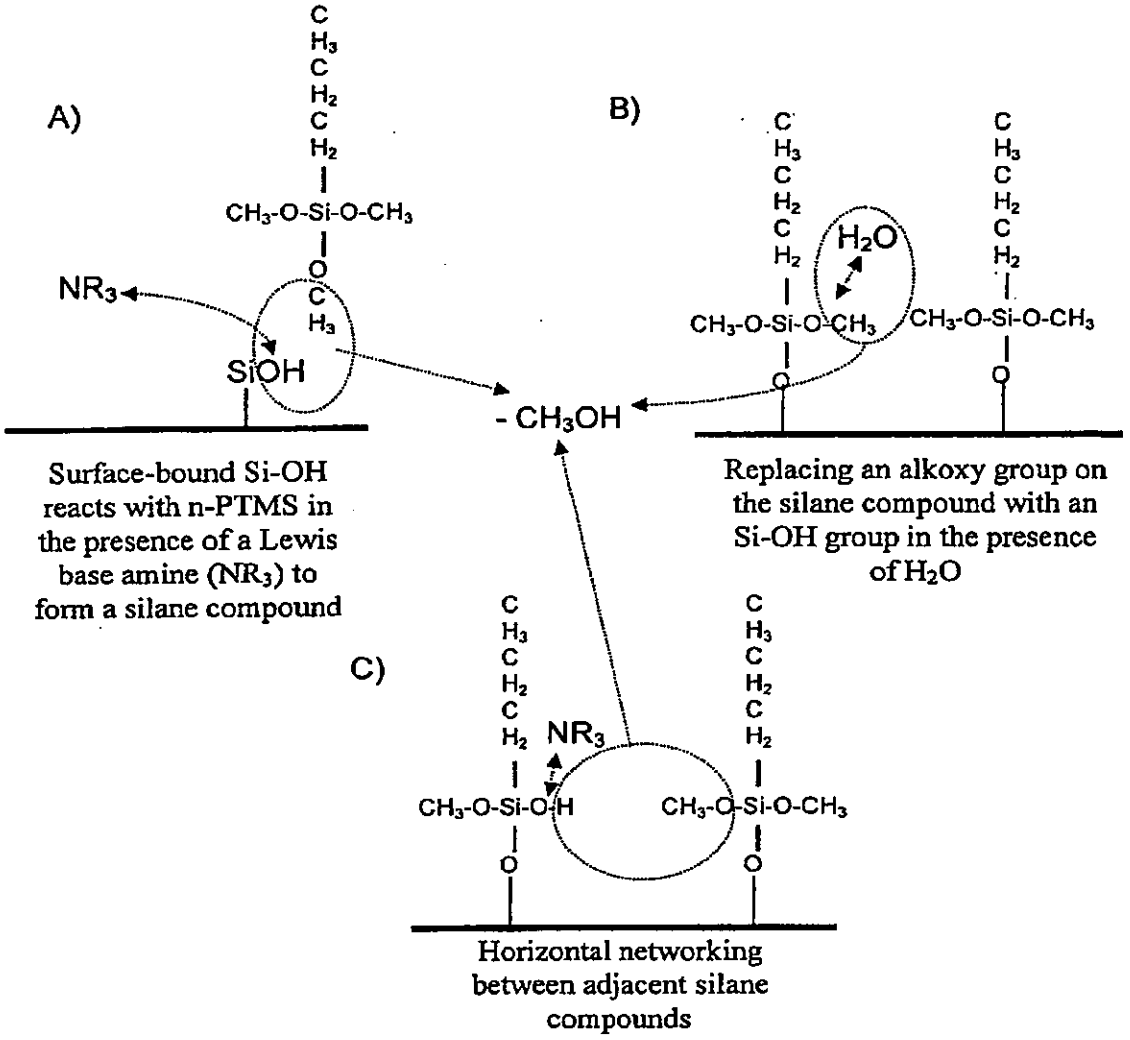
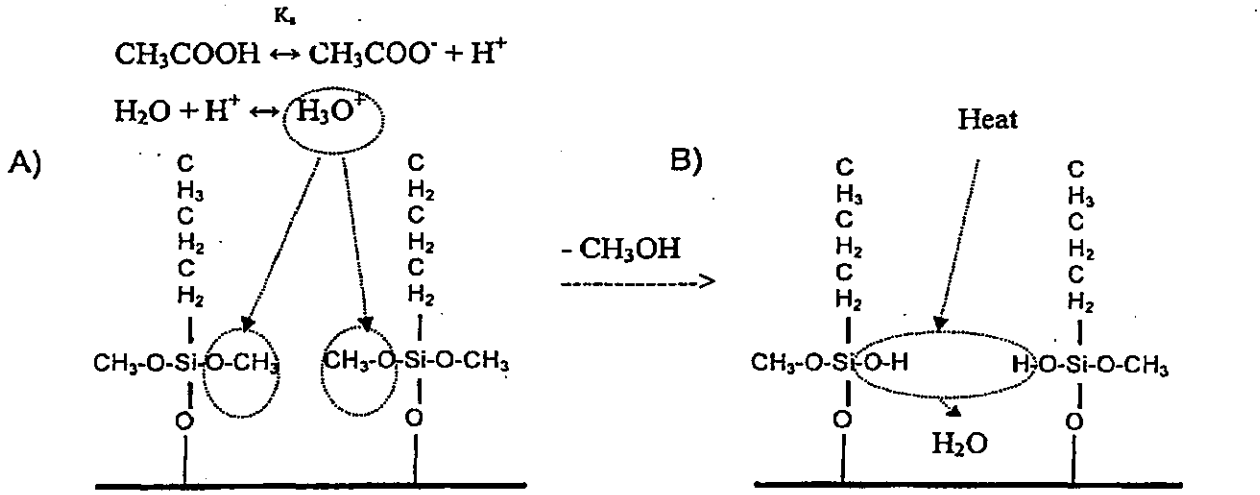

A)
B)
C)
NR3
SiOH
- CH3OH
H2O
Surface-bound Si-OH reacts with n-PTMS in the presence of a Lewis base amine (NR3) to form a silane compound
Replacing an alkoxy group on the silane compound with an Si-OH group in the presence of H2O
Horizontal networking between adjacent silane compounds

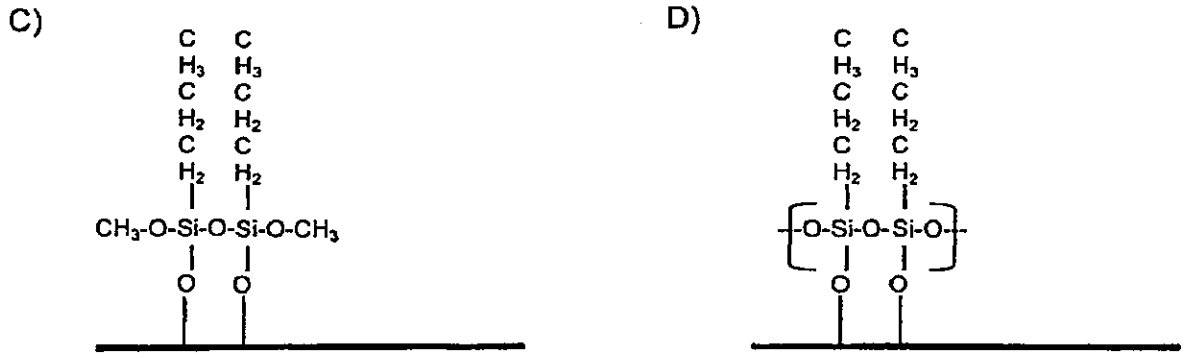
FIG. 2

HORIZONTAL NETWORK FORMATION USING ORGANIC ACIDS AS CATALYSTS TO ACCELERATE HYDROLYSIS



Organic Acid(s) (*e.g.*, acetic acid) increase the rate of hydrolysis of the alkoxy groups on the silane compounds

The application of heat results in the condensation of water as a by-product



After the condensation of water -Si-O-Si- bonds are formed to create a partial network of silane compounds

All alkoxy groups are removed from the silane compounds to form a completed network of silane compounds

FIG. 3

Increased Reaction Efficiency with Amine Catalysts

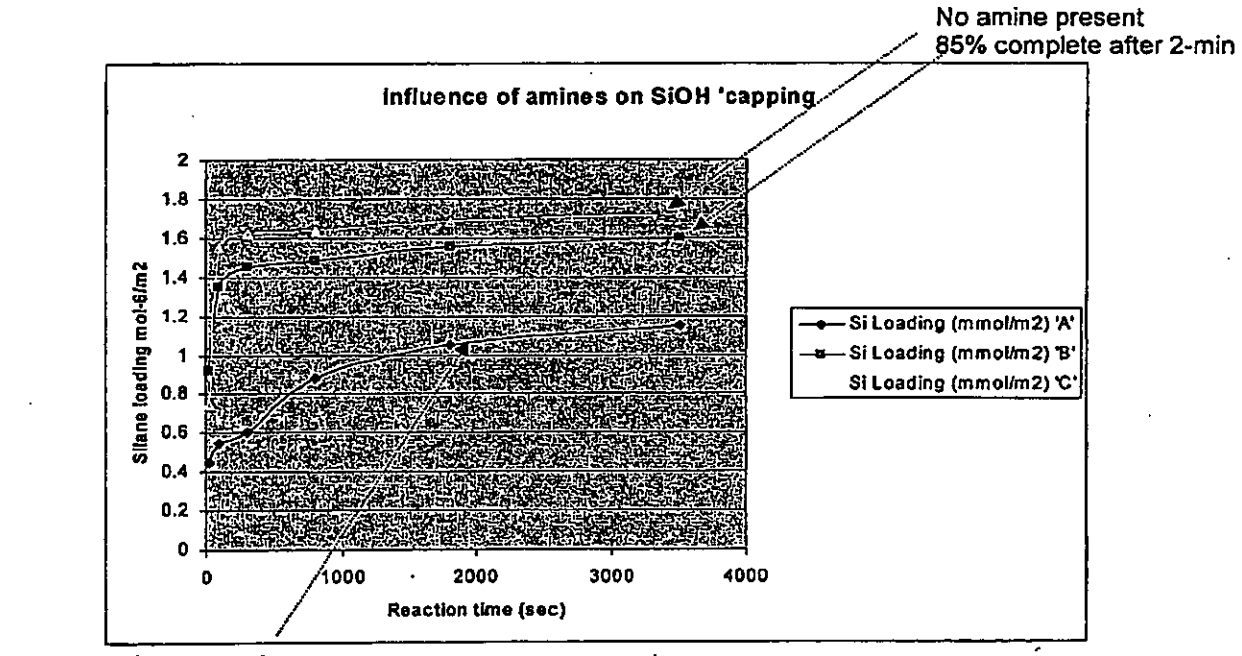
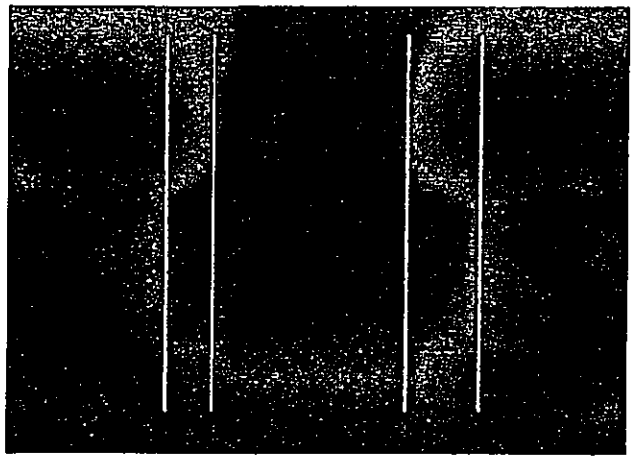


FIG. 4



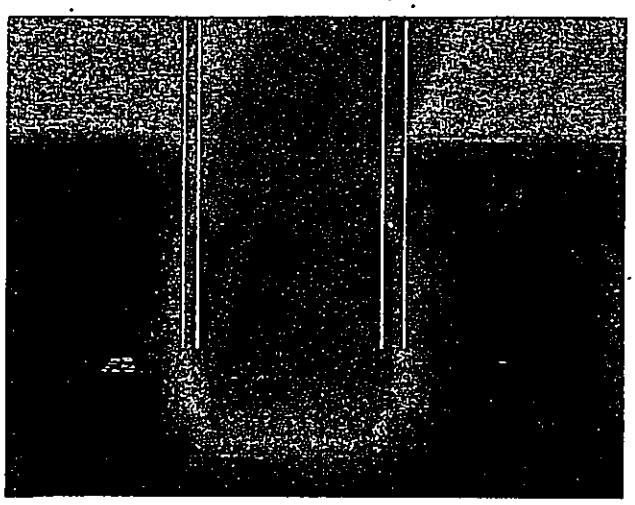


FIG. 5