Chemo-Mechanical Polishing/Planarizing
Glossary Terms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A

Term	Definition
Acidic solution	A solution with a pH value less than 7.
Active metal	A metal that is readily oxidized.
Anode	Surface where oxidation occurs.
Ashing	Removal of photoresist is a plasma reactor.
Aspect ratio	The ratio of the depth to width of a device structure.
Asperity	High points on a pad (or wafer) surface.

B

Term	Definition
Backing film	An adhesive film used to hold the wafer in place during CMP. There are a variety of backing films available.
Basic solution	A solution with a pH value greater than 7.
BPSG	Refers to borophosphosilicate glass. BPSG is silicon dioxide doped with boron (B) and phosphorous (P).
Breakdown voltage	The voltage required to break down and destroy a dielectric.

C

Term	Definition
Cap oxide layer	A final layer of oxide that is removed during a CMP process.
Capacitance	A measure to the charge storage capacity of a capacitor.
Capacitor	An electrical component made up of two conducting plates which are separated by a dielectric material that functions as a charge for storage device.
Cathode	Surface where reduction occurs.
CMP	Chemical mechanical polishing is a surface polishing/planarizing process that combines physical abrasion with a chemical etch. The wafer is rotated in contact with a polishing pad as an abrasive slurry is fed onto the pad.
Concentration	Amount of a substance per unit volume.
Condensation reaction	A reaction in which water is released upon bond formation.
Conditioning	Process that helps restore the original properties of a pad.
Conformal	A thin film that has the ability to replicate or take the same form as the surface topography.
Contact hole	A hole etched into oxide to provide electrical contact between the first interconnect level and the silicon substrate.
Contact resistance	The resistance to current flow that occurs at the interface between two dissimilar metals.
Crosslinking	Chemical binding of polymer chins.
CVD	Chemical vapor deposition forms solid films on a wafer substrate as the result of chemical reactions of gases at the wafer surface. Only the solid is left behind and all other gaseous products are removed from the reaction chamber.

D	
Damascene	A CMP process primarily used with metals in which all of a given metal layer is removed and the process endpoint occurs when the underlayer is exposed. Often used to create tungsten plugs, copper lines, and shallow trench isolation with dielectric material.
Damascene Interconnect	Interconnects that are inlayed into a trench formed in the oxide or dielectric layer.
Depth of focus	The range on either side of the center of focus where the exposure energy is constant and equal. It is depth of focus limitations which make chemical mechanical polishing necessary.
Dielectric	An insulating material used to electrically isolate specific elements, devices, or layers.
Dielectric constant, k	The ability of a substance to resist current flow.
Dielectric strength	Measure of the maximum electric field that an insulator can withstand before breaking down.
Diffusion	A chemical process which introduces dopants into the wafer by using reactant gases flowing across the wafer.
Dishing	Generally used to refer to the phenomenon which occurs when the material in a trench is polished simultaneously with the surrounding exposed material. The trench material is then recessed and this can lead to electrical problems in the device.
Double layer	Two charge regions that form near an oppositely charged surface.
Downforce	A term used to refer to the pressure applied to force the wafer down onto the polishing pad.
E	
Edge exclusion	Region on the edge of the wafer that is not planarized properly.
Electromigration	The movement of atoms in response to current flow.
Electrostatic forces	Charge to charge interactions.
Empirically	Determined by experiment.
Epitaxial growth	The growth of single-crystal film on an existing single-crystal substrate.
Erosion	A selectivity problem in which an excess of the underlying thin film is removed.
Etching	The process of removing unwanted material from the wafer surface.
G	
Galvanic couple	Two dissimilar metals in electrical contact (and exposed to a solution).
Glazing	A degrading of the polishing pad that occurs as the pad grooves begin to wear down. The pad surface takes on a glazed appearance such that slurry flow, and thus removal rate, are reduced.
Global planarization	Planarization process in which R (relaxation distance – see other definitions) is in the range of millimeters.
H	
High density plasma chemical vapor deposition	Deposition process that uses a high density plasma to provide the energy for the chemical reaction.

Hydroxilation	The formation of hydrogen bonds between oxides on the wafer surface and the slurry particles.
Hygroscopic	A water absorbing substance.
I	
ILD	Interlevel dielectric is a term used to refer to the insulating material (usually SiO_2) deposited between conducting layers or between active devices.
Ingot	A doped, cylindrical, single-crystal form of solid silicon produced by the CZ method. Also referred to as a boule or log.
Integrated circuit	An electronic device containing from hundreds to millions of electronic components, arranged to perform a prescribed function or functions.
Interference pattern	The pattern that develops when waves are combined.
Interferometry	An endpoint detection method that measures combined reflected light to determine the thickness of a thin film.
Ionic strength	A measure of both the amount of ions in a solution and the charges associated with the ions.
Ion implantation	A doping process which uses powerful electrical and magnetic fields to accelerate dopant ions toward the wafer.
L	
Local planarization	Planarization process in which R (relaxation distance – see other definitions) is in the range of <100 µm.
Low-*k*	Refers to an insulating material with a low dielectric constant (*k*=dielectric constant). As device features move into the sub 0.25 µm region, low-*k* dielectrics will become increasingly important.
M	
Mechanism	Series of steps in a chemical reaction.
Mini-environment	A term which refers to the clustering of several tools, performing separate functions, into a single sealed work environment which the wafers never leave until all processes are completed. In CMP, mini-environment could be used to describe a work area in which a CMP tool, post-CMP cleaning station and metrology tools are all contained within the same clean area. Cluster tool is another term commonly used.
Mobile ion contamination	Contamination by ions that can migrate through thin films.
Monomer	Basic unit of a polymer.
N	
Noble metal	A metal that is resistant to oxidation.
Numerical aperture	The ability of a lens to collect scattered light.
O	
Oxidation	Growth of high quality oxide on exposed wafer surfaces.
Oxidation/reduction reaction	Reactions that involve the transfer of electrons from one chemical species to another.
Oxidizing Agent	The chemical species that accepts electrons in an oxidation/reduction reaction.

P	
Pad conditioning	A process in which the polishing pad is "roughed up" by an abrasive disc in order to offset the effects of glazing. Conditioning enhances pad performance, but reduces overall pad lifetime.
Pad Deglazing	Removal of solids from the pores of a pad.
Passivation layer	A thin film that is deposited to protect an integrated circuit from the outside environment.
Photolithography	The process by which a pattern is transferred from a mask or reticle to the wafer surface.
Pitch	The distance between metal lines.
Planarity	The measure of overall die flatness.
Planarization	Removal of topographical features.
Planarization angle (O)	The angle formed between the surface of the wafer and a line drawn between topographical levels.
Planarization efficiency	A measure of the amount of material that must be removed in order to achieve a planar surface.
Plasma enhanced chemical vapor deposition	Deposition process that uses plasma to provide the energy for the chemical reactions.
Platen	The rotating base on which the polishing pads are placed. Sometimes referred to as the polishing "table".
Polishing	Smoothing the surface of the wafer in order to remove defects or a portion of a thin film.
Polishing pad	A pad which is mounted on a rotating platen and polishes the wafer. Polishing pads come in a variety of materials and are designed with a variety of surface features depending on the process results needed.
Primary polish	In a multi-polish process, the primary polish refers to the step where the bulk of the material is removed. This is then followed by a secondary polish.
Polymer	A long chain made of repeating units called monomers.
R	
Relaxation distance (R)	Taper distance from the edge of a step to the next level of topography.
Removal rate	The amount of material removed by CMP in a given time frame. It is generally expressed in Å/minute.
Resistivity	A measure of the difficulty to the conduction of electricity.
Resolution	The smallest feature size that can be produced repeatedly.
S	
Secondary polish	In a multi-polish process, a secondary polish or light buff is used to lessen the effects of any surface damage and/or dishing which may have occurred during the removal of material during the primary polish.
Selectivity	Ratio of the relative removal rates of two thin films.
Shallow trench isolation (STI)	A trench etched into the single crystal silicon and subsequently filled with oxide in order to electrically isolate devices.
Sheet resistance	A metric that relates the resistivity and the thickness of a thin film.

Slurry	An abrasive mixture containing particles of colloidal silica, alumina, or some other abrasive material suspended in a chemical compound and DI water. Slurry is fed into and through the polishing pad during chemical mechanical polishing in order to remove material from the wafer surface.
Smoothing	Process in which, R (relaxation distance), O (planarization angle), and step height remain unchanged.
Specific gravity	Ratio of the density of a material to the density of water.
Spin on glass (SOG)	A form of silicon dioxide that is spun onto the wafer.
Step coverage	Relative coverage of vertical and horizontal surfaces of a device.
Surface roughness	A measure of the smoothness of a surface.
T	
Topographical selectivity	Ration of the relative removal rates of high topographical features and low topographical features.
U	
Uniformity	The measure of film thickness (or removal rate) variations across the wafer.
V	
Van der Waals interactions	Intermolecular interactions between permanent dipoles moments or induce dipole moments.
Voids	Regions on an interconnect that are depleted of metal.
W	
Wafer	A thin, usually circular, piece of single-crystal semiconducting material.
Wafer carrier	In CMP, the term wafer carrier is used to refer to the part of the tool which holds the wafer face down and brings the wafer in contact with the polishing pad. It is sometimes referred to as the wafer “head”.
Y	
Young’s modulus	A measure of the elasticity of a material.
Z	
Zeta potential	The measure of the electrostatic forces which exists between particles and the wafer surface.

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