

## INFORMATIONAL POLYMER FILM INSERT MOLDING

This application claims priority to U.S. Provisional Application No. 60/333,687, filed November 27, 2001, entitled POLYMER FILM INSERT MOLDING FOR BONDING A BARCODE TO A WAFER CARRIER, and U.S. Provisional Application No. 60/333,681, filed November 27, 2001, entitled INFORMATIONAL POLYMER FILM INSERT MOLDING, each of which is hereby fully incorporated herein by reference.

### FIELD OF THE INVENTION

The present invention relates generally to film insert molding, and more particularly to insert molding a thin polymer film during the molding of a plastic semiconductor material handling article to mark indicia, including electronically readable indicia, on the article.

### BACKGROUND OF THE INVENTION

Film insert molding is used in manufacturing processes to increase aesthetic appeal in various consumer products. Specifically, decorative decals, instructions, logos, and other visual graphics may be printed on one surface of a thin transparent polymer film and insert molded with a plastic portion of the product to achieve a desired visual effect. In addition, film insert molding is sometimes used to permanently affix functional indicia such as barcodes to a product.

Typically, as used in an injection molding process, an insert film is placed into a cavity of a mold prior to the injection of molten polymer material. As the molten material solidifies in the mold, a permanent bond is created between the transparent film and the molded part. Using this process, the desired decorative or functional indicia may be selectively, permanently, placed on the part for relatively low cost. Moreover, the desired indicia may be placed around complicated contours and in difficult-to-reach locations on the product. An additional benefit is that the manufacturing process is simplified by eliminating the need to have the indicia etched or shaped into the actual surface of the mold itself. This increases design and manufacturing flexibility, and the level of detail that can be included in the final product.

The use of film insert molding to apply functional indicia has been limited. Typically, the desired indicia are screen printed on the insert film. While this is satisfactory for runs where the identical image is to be applied to all of the products, screen printing is not readily adaptable to an application where a unique image, such as a sequential, unique, barcoded serial number or other similar information, is to be applied to each separate device. Alternatives to screen printing for such information have proven to be elusive for a variety of reasons. As a result, such information is attached to consumer products most often using an adhesive label rather than being film<sup>4</sup>insert molded.

In the semiconductor device manufacturing industry, it is necessary to store, and transfer for use, large quantities of expensive material, particularly silicon wafers. Specialized containers have been developed to protect silicon wafers from contamination, as well as physical and electrical damage, during storage and handling. Examples of such specialized containers are described in U.S. Patent Nos. 6,428,729, 6,039,186, 5,485,094, and 5,944,194, all of which are hereby fully incorporated herein by reference. Other handling devices, such as chip trays, are used for handling semiconductor components in various stages of completion. These devices also often have specially designed features to minimize contamination and damage to the components.

It is advantageous to have a means of automatically tracking containers, devices, and the materials contained therein in order to attain maximum efficiency and cost effectiveness in a semiconductor fabrication process. One method of automatically tracking semiconductor handling articles and contents is to affix electronically readable indicia to the article that may then be read at various processing locations. Using such a method in conjunction with a computer and automated handling devices, the articles may be precisely tracked and routed to process locations automatically. An example of such a system for wafer containers is described in U.S. Patent No. 4,833,306, which is hereby fully incorporated herein by reference.

It is also advantageous to mark various other indicia on semiconductor handling devices and articles. Such indicia may include information, such as logos or names, indicative of the origin of the article, patent markings, instructions and warnings.

Because of the extremely small scale and high precision necessary for the manufacture of modern semiconductor devices, there is a need for an extremely high degree of purity and freedom from contamination in all devices, containers and other

articles used in processing. Semiconductor device fabrication is typically carried out in an environment commonly known as a "clean room", wherein the room is protected from chemical and particulate contamination to the extent technically and economically feasible. Small particles of dust or a film of chemical contaminants on a substrate or  
5 reticle during a photolithography process, for example, can result in defective and completely unusable semiconductor components. Consequently, materials used for wafer containers and other handling articles must be as free as possible from solvents or other such chemicals that can "offgas" and contribute contaminants that may then precipitate on critical surfaces. Also, the materials must be abrasion resistant so as not to create  
10 particulate matter that may contaminate the process.

Various polymer materials have been found to be especially suitable for use in semiconductor process handling equipment and articles, such as wafer containers and chip trays. These polymer materials include, for example, polycarbonate (PC), polyimide (PI), polyetherimide (PEI), polyethylethylketone (PEEK), polyethersulfone (PES), polysulfone  
15 (PS), polymethylmethacrylate (PMMA), perfluoroalkoxy (PFA), and fluorinated ethylene propylene copolymer (FEP). In general, these materials are relatively abrasion resistant and do not give off significant amounts of chemical contamination through offgassing.

The high degree of purity required and the characteristics of the materials used have presented problems in affixing indicia to wafer containers and other articles used in  
20 semiconductor fabrication environments. It is generally undesirable to use a surface adhered tag or label carrying indicia, for example, since the solvents in the adhesive used to adhere the tag or label will contribute chemical contamination to the process. Moreover, inks used to print the indicia also contribute chemical contamination to the semiconductor fabrication process. In addition, the materials used for the articles are  
25 generally difficult to bond with adhesives.

Generally, indicia such as logos, patent markings and the like have been marked on wafer containers and other articles by forming negative features in the mold, which thereby form positive, raised or engraved features in the article itself. This method, however, is relatively costly and does not lend itself to affixing often changed information  
30 or unique information such as barcoded product serial numbers. In addition, such features have only one color.

For sequential information such as bar codes, some prior systems have used a tag carrying a barcode that is subsequently "buried" within a portion of a transparent wafer container shell. Burying the tag within the container shell or portion of the article avoids chemical or particulate contamination from the tag, but is difficult to accomplish and may be very expensive. In addition, any lack of transparency in the base material may inhibit the electronic readability of the indicia.

What is still needed is a method and system for effectively attaching indicia, including barcodes or other electronically readable indicia, to a wafer container or other semiconductor handling article for use in a semiconductor fabrication clean room environment.

### SUMMARY OF THE INVENTION

The present invention relates generally to a system and method for using a thin polymer film member to bond indicia in the molding process for manufacturing wafer containers and other plastic articles for use in the semi-conductor manufacturing industry, and particularly such articles for use in semiconductor fabrication clean room environments. The system and method enables multicolored indicia and unique electronically readable indicia to be bonded to the article, while also providing a protective, containment barrier to inhibit process contamination stemming from the indicia and to protect the indicia from physical damage.

The film member of predetermined size and shape is selectively placed in a mold cavity for alignment with a desired target surface of an article to be molded. The film member may be a single layer with the indicia printed on a surface thereof, or may be a multi-layer member with the indicia encapsulated between the layers. During the molding process, a surface of the film is bonded with a surface of the article such that film is permanently adhered to the finished molded article. In the single layer embodiment of the film member, the surface printed with the indicia is an inner surface so that the indicia are encapsulated between the article and the film member, so that the film member forms a protective, containment barrier for the indicia. In the multi-layer embodiment, the indicia are encapsulated between an inner layer and an outer layer. The outer layer forms a protective, containment barrier for the indicia, while the inner layer may protect the indicia from damage during the molding process, as well as serving as a tie layer for enhancing the bonding strength between the film member and the article.

Accordingly, the invention may include a wafer container having indicia marked thereon. The container may include an enclosure portion made from polymer material and adapted for holding at least one wafer and a film portion molded on the enclosure portion. The film portion is marked with the indicia and is adapted so as to form a protective  
5 containment barrier for the indicia.

The invention may also include a method of making a wafer container having indicia marked thereon, wherein the wafer container includes an enclosure portion. The method may include the steps of forming a film member from polymer film material, marking the film member with indicia, positioning the film member on a shaping surface  
10 of a mold, molding polymer material over the shaping surface of the mold and the film member to form the enclosure portion. The film member is thereby permanently bonded with the enclosure portion, the film member forming a protective, containment barrier for the indicia.

The invention may further include a system for molding at least a portion of a  
15 semiconductor handling article usable in a clean room environment and marking said article portion with indicia. The system includes a quantity of moldable polymer material sufficient to form the article portion, a polymer film member marked with indicia, and a molding unit. The molding unit may have a pair of opposable shaping surfaces operably positionable to define a mold cavity for shaping the article portion. One of the shaping  
20 surfaces has a region adapted to receive the polymer film member with substantially all of the surface of the polymer film member in contact with the region. The molding unit further includes means for injecting the quantity of moldable polymer material in a molten state into the mold cavity. In operation, when the moldable polymer material solidifies, the polymer film member is thereby permanently bonded with a surface of the finished  
25 article portion, and the film member forms a protective, containment barrier for the indicia.

An object and feature of particular embodiments of the present invention is the cost-efficient process of selectively utilizing desirable polymer film such that it is not necessary to utilize more of the polymer than is required.

30 Another object and feature of particular embodiments of the present invention is to allow for the selective and targeted bonding of indicia, such as a barcode, or other

electronically readable indicia, without the use of adhesives or other potential contaminants.

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a wafer container having indicia insert molded thereon according to the present invention;

Fig. 2 is an elevation view of another embodiment of a wafer container having indicia insert molded thereon according to the present invention;

Fig. 3 is a view of a portion of Fig. 2 showing a film member with electronically readable indicia marked thereon;

Fig. 3A is a view of a portion of Fig. 2 showing a film member with indicia marked thereon;

Fig. 3B is a view of a portion of Fig. 2 showing a film member with other indicia marked thereon;

Fig. 4 is a cross-sectional view of one embodiment of the film member of the invention taken through line 4-4 of Fig. 3;

Fig. 5 is a cross-sectional view of an alternative embodiment of the film member of the invention taken through line 5-5 of Fig. 3;

Fig. 6 is a simplified cross-sectional view of a molding apparatus;

Fig. 7 is an enlarged view of a portion of the apparatus of Fig. 7 depicted an insert molding portion of the apparatus; and

Fig. 8 is a perspective view of a plurality of chip trays having film insert molded indicia according to the present invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figs. 1 and 2 depict, in exemplary fashion, embodiments of wafer containers used in semiconductor manufacturing processes. Each depicted container 10 generally includes an enclosure portion 12, a kinematic coupling portion 14, and a robotic handling flange 16. Enclosure portion 12 generally includes a top 18, a bottom 20, a pair of opposing sides 22,

24, a back 26, and an open front 28. Open front 28 may be selectively closable by means of a door 30. Within enclosure portion 12, one or more wafer support portions 32 are provided to support wafers in a parallel, spaced apart, relationship to each other. Although the wafer containers depicted herein are of the front opening type, many other styles of wafer containers exist, and those containers may be used in a multiplicity of different applications. For example, in addition to the front opening unified pod (FOUP) design depicted here, other container designs such as FOSBs, and SMIFs are also in common use within semiconductor device fabrication facilities. In addition, other types of specialized containers may be used for shipping and other purposes. An example of such a container used for shipping is disclosed in U.S. Patent No. 5,642,813, hereby fully incorporated herein by reference.

In Figs. 1-5, an insert film member 34 is depicted insert molded with enclosure portion 12 of wafer carrier 10. Film member 34 has indicia 36 marked thereon, which may be a barcode 38, a string of characters 40 which are readable by means of optical character recognition (OCR) equipment, or any other type of electronically readable indicia. As depicted in Figs. 3A and 3B, indicia 36 may also be other types of indicia, such as a company name or logo 37, patent marking information 39, or any other type of graphic or printed indicia that it may be desirable to attach to the wafer carrier 10.

Figs. 4 and 5 depict, in cross section, two different embodiments of film member 34, each having an inner surface 44 and an outer surface 45. In the embodiment of Fig. 4, film member 34 is made from a single layer 42 of transparent polymer film material. The electronically readable indicia 36 are printed with ink on inner surface 44 of layer 42. When film member 34 is insert molded with enclosure portion 12 as depicted, the indicia 36 are encapsulated between film member 34 and enclosure portion 12, with film member 34 forming a protective containment barrier for indicia 36. Specifically, film member 34 inhibits offgassing of any solvents or other undesirable chemicals that may be contained in the ink used to print indicia 36, and also protects the indicia from physical damage.

The polymer film material used to form layer 42 may be any suitable polymer composition exhibiting the desired properties of abrasion resistance for protection of the indicia, and relatively low permeability so as to form a barrier to permeation of chemical contaminants from the indicia. It is currently preferred that layer 42 be made from PEEK, due to its low permeability, high purity and abrasion resistance, but may also be made

from other materials commonly used in semiconductor fabrication clean environments. Such materials include, for example, polyester (PE), polycarbonate (PC), polyimide (PI), polyetherimide (PEI), perfluoroalkoxy resin (PFA), polyvinylidene fluoride (PVDF), polymethylmethacrylate (PMMA), polyethersulfone (PES), polystyrene (PS), and polyphenylene sulfide (PPS). In addition, alloys of these or other such suitable polymer materials may be used to achieve desired film member properties, such as flexibility, or resistance to heat shrinkage and creep. Moreover, if desired, carbon fibers, carbon nanotubes, or ceramic particulates may be added to achieve desired electrical properties for static dissipation or conductivity. As an alternative, inherently electrically conductive doped polymer compositions such as polyaniline or polyacetylene may be alloyed with layer 42 to achieve desired electrical properties.

Film member 34 may be cut to a predetermined shape and size depending on the particular needs of the bonding application. After cutting, film member 34 may be thermoformed to a desired shape. Generally, film member 34 is thin and sheet-like to facilitate moldability and to maximize transparency for optimal readability of the indicia.

Electronically readable indicia 36 are preferably digitally printed on inner surface 44 of layer 42 using ink, but any suitable apparatus may be used for printing that enables indicia to be printed on each separate film member 34 in a sequence or array of such film members. It is currently preferred that the indicia be digitally printed with a digital offset printer such as the Indigo digital offset presses available from Hewlett Packard Company of Palo Alto, California, USA. These digital offset printers are capable of printing a different image with each revolution of the offset cylinder. Thus, sequentially coded indicia, such as sequential barcodes can be printed easily and with the same press as other non-sequential indicia, such as logos or informational messages. In addition, the indicia may be simultaneously printed in more than one color. Of course, any other suitable printing method may also be used to form the indicia, including for example conventional offset printing, screen printing, or other known printing method.

Any suitable ink may be used that will withstand the temperature and shear forces encountered in the insert molding process without smearing, bleeding or other undesirable distortion of the indicia. One suitable ink material for the purpose that is especially compatible with the offset printing apparatus described above in the ElectroInk product, also available from Hewlett Packard Company. This ink is preferred for its temperature

resistance and high resolution properties. However, any other ink product having the desired properties may also be used. It will be appreciated that inks of any variety of colors may be used, enabling multi-colored logos and the like to be used in the present invention.

5 In addition, to printing processes using ink, it is anticipated that other marking materials and processes may be used in place of ink marking, such as xerography or laser printing. If these processes are used, or if printing inks are used that do not have the necessary temperature and shear resistance properties to withstand the insert molding process, the indicia may be overcoated with a layer of protective material having the  
10 desired properties. For example, a coating of high-temperature, shear resistant ink may be spray or contact applied over inner surface 44 after indicia 36 have been applied. One suitable ink for this purpose is the Proell line of inks available from Pröll HG of Weissenburg, Germany. Of course, any other suitable product having similar high-temperature, shear resistance characteristics may also be used. Upon drying, the layer of  
15 ink forms a protective coating over the printed indicia that will withstand the insert molding process. Of course, it will be appreciated that any other suitable coating material and process may also be used to form the protective coating that will withstand the temperature and forces exerted during the insert molding process, and that does not significantly negatively affect the strength of the bond formed between film member 34  
20 and enclosure portion 12. Such materials and processes may include, for example, known optical coating materials used for scratch resistance, or ultraviolet resistance, and applied by plasma enhanced chemical vapor deposition processes or the like.

An alternative embodiment of film member 34 is depicted in Fig. 5. In this embodiment, film member 34 includes a inner layer 46 that may be transparent,  
25 translucent, or opaque, and a transparent outer layer 48. Electronically readable indicia 36 may be marked, as described herein above, on the outer surface 50 of inner layer 46 or the inner surface 52 of outer layer 48. The layers may then be joined together by lamination, overmolding or any other suitable method to form film member 34. A myriad of film lamination techniques known to one skilled in the art are envisioned for use with the  
30 present invention in this regard. For instance, U.S. Patent Nos. 3,660,200, 4,605,591, 5,194,327, 5,344,703, and 5,811,197 disclose thermoplastic lamination techniques and are incorporated herein by reference. The indicia are thus encapsulated between inner layer 46 and outer layer 48, with outer layer 48 forming a protective, containment barrier for

indicia 36 as before. Film layer 34 may then be insert molded into enclosure portion 12 as before. As will be appreciated, this multi-layer embodiment of film member 34 may offer the advantage of encapsulating the indicia through a relatively low temperature process such as lamination, thereby imposing less demanding temperature and stress requirement  
5 for the ink or other medium used to mark the indicia.

In a multi-layer film member 34, such as is depicted in Fig.5, inner layer 46 may serve as an intermediate or "tie" layer, such as may be needed to bond dissimilar polymer materials used for outer layer 48 and enclosure portion 12. For example, if outer layer 48 is formed from PEEK and enclosure portion 12 is formed from polycarbonate (PC), inner  
10 layer 46 may be polyetherimide (PEI) material, which generally forms a stronger bond with both PEEK and PC than would be formed if PC were bonded directly with PEEK. As will be appreciated, any number of such intermediate layers may be used as desired to obtain an optimal combination of materials for maximum bonding strength.

Generally, once the film member 34 is prepared as described in detail herein, any  
15 known insert molding apparatus and process may be used to insert mold film member 34 in enclosure portion 12. One example of a suitable apparatus, of the injection molding type, is depicted in a simplified cross-sectional view in Figs. 6 and 7. Molding apparatus 54 generally includes female member 56, which presents shaping surface 58, and male member 60, which presents shaping surface 62. Mold cavity 64 is defined between  
20 shaping surface 58 and shaping surface 62. Male member 58 or female member 56 or both are movable so as to enable access to the shaping surfaces of each.

Female member 56 has a number of injection channels 66, through which molten polymer material may be forced into mold cavity 64 during the molding process. In film insert molding, one or more molding regions 68 are generally defined on a shaping surface  
25 of the mold. These molding regions correspond to a target region on a completed wafer carrier enclosure 12, where it is desired to affix the electronically readable indicia. Vacuum channels 70, extending through female member 56 from an opening 72 in shaping surface 58 to an opening 74 on the exterior 76 of the member, may be provided as a means to temporarily hold a film insert member 34 in place on molding region 68. It  
30 will be appreciated that any other suitable method or means may be used to hold film member 34 in place on molding region 68, including friction, static electricity, or temporary fasteners.

In operation, female member 56 and male member 60 are separated to provide access to molding region 68. A vacuum source is applied to vacuum channels 70, and film member 34 is positioned on molding region 68 and over openings 72 with substantially all of surface 73 in contact with shaping surface 58. Film member 34 is thereby held in place by the vacuum. Female member 56 and male member 60 are then positioned in proximity so as to define mold cavity 64 corresponding to the form of enclosure portion 12. A quantity of molten polymer material 78 sufficient to completely fill mold cavity 64, and thereby form enclosure portion 12, is forced through injection channels 66 into mold cavity 64. After the molten polymer material cools and solidifies, female member 56 and male member 60 are separated so that completed enclosure portion 12, with film member 34 insert molded therein, may be ejected from the mold.

The polymer material 78 is generally plastic material as is commonly used in molding parts used in the semiconductor manufacturing industry. Typically, polymer material 78 is polycarbonate, but may also be any such suitable material such PEEK, PI, PEI, or other material or polymer alloy.

After the molding process described above is complete, the enclosure portion 12 may be subjected to additional molding and assembly processes to produce a completed wafer carrier 10. These processes may include additional overmolding processes wherein the molded enclosure portion 12 may be subjected to additional heating. Co-pending U.S. Patent Application 09/317,989 owned by the present applicant discloses the use of overmolding to manufacture wafer carriers and is herein incorporated by reference. In addition, U.S. Patent No. 6,439,984 discloses molding techniques for wafer carriers and is herein incorporated by reference as well. It will be appreciated that the insert molded film must be capable of withstanding these possible follow-on processes as well.

As will be appreciated, in addition to wafer containers, the film insert molding apparatus and processes disclosed herein may be used in similar fashion to affix indicia to any other semiconductor handling articles used in semiconductor processing clean room environments, such as, for instance, chip handling and matrix trays. Examples of such chip handling trays are disclosed in U.S. Patent Nos. 5,484,062 and 6,079,565, each of which are hereby fully incorporated herein by reference. Fig. 8 depicts, for exemplary purposes, a plurality of chip handling trays 80, each having a body portion 82 with a film member 34 having indicia 36 insert molded therein according to the present invention.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is, therefore, desired that the present embodiment be considered in all respects as illustrative and not restrictive.

## CLAIMS

What is claimed is:

1. A wafer container having indicia marked thereon comprising:
  - an enclosure portion made from polymer material and adapted for holding at least one wafer; and
  - a film portion molded on said enclosure portion, said film portion being marked with the indicia, said film portion adapted so as to form a protective containment barrier for said indicia.
2. The wafer container of claim 1, wherein said film portion is transparent polymer material and has an inner surface directly bonded to said enclosure portion, said indicia being marked on said inner surface so that said indicia are encapsulated between said film portion and said enclosure portion.
3. The wafer container of claim 2, wherein said inner surface and said indicia are coated with a layer of temperature and shear resistant ink.
4. The wafer container of claim 1, wherein said indicia are marked with temperature and shear resistant ink.
5. The wafer container of claim 1, wherein said film portion includes at least a pair of layers, a first layer having the indicia marked on a surface thereof, a second layer made from polymer film material, a surface of the second layer being bonded to the surface of the first layer marked with the indicia so that the indicia are encapsulated between the pair of layers.
6. The wafer container of claim 5, wherein one of said pair of layers is an inner tie layer for improving the bond strength between the film portion and the enclosure portion, wherein the other of said pair of layers is an outer layer, and wherein said tie layer is disposed between said enclosure portion and the outer layer.
7. The wafer container of claim 1, wherein said film portion is constructed substantially of a material selected from the group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene

propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

8. The wafer container of claim 1, wherein the film portion is constructed substantially of polyetheretherketone.

9. The wafer container of claim 1, wherein the indicia are electronically readable indicia.

10. The wafer container of claim 9, wherein said electronically readable indicia include at least one bar code.

11. A method of making a wafer container having indicia marked thereon, the wafer container including an enclosure portion, the method comprising the steps of:

forming a film member from polymer film material;

marking the film member with indicia;

positioning the film member on a shaping surface of a mold; and

molding polymer material over the shaping surface of the mold and the film member to form said enclosure portion, the film member being thereby permanently bonded with the enclosure portion.

12. The method of claim 11, wherein the film member is transparent, wherein the indicia are marked on a surface of said film member, and wherein the step of positioning the film member includes placing the film member so that the surface marked with indicia faces away from the shaping surface and so that the indicia are encapsulated between the film member and the enclosure portion when the enclosure portion is formed.

13. The method of claim 11, wherein the film member includes a pair of separate layers, and wherein the method includes the steps of marking a surface of one of the layers with the indicia, and bonding the other of the layers to the surface of the layer marked with the indicia so that the indicia are encapsulated between the pair of separate layers.

14. A system for molding at least a portion of a semiconductor handling article usable in a clean room environment and marking said article portion with indicia, the system comprising:

a quantity of moldable polymer material sufficient to form the article portion;

a polymer film member having an inner surface marked with indicia, the film member also having an outer surface; and

a molding unit having a pair of opposable shaping surfaces operably positionable to define a mold cavity for shaping the article portion, one of the shaping surfaces having a region adapted to receive the polymer film member with substantially all of the outer surface of the polymer film member in contact with the region, the molding unit further including means for injecting the quantity of moldable polymer material in a molten state into the mold cavity, wherein the polymer film member is thereby permanently bonded with a surface of the finished article portion when the moldable polymer material solidifies, and wherein said film member forms a protective, containment barrier for said indicia.

15. The system of claim 14, wherein said film member is formed from transparent polymer material and has an inner surface, said indicia being marked on said inner surface so that said indicia are encapsulated between said film portion and said enclosure portion.

16. The system of claim 14, wherein said film member includes at least a pair of layers, a first layer having the indicia marked on a surface thereof, a second layer made from polymer film material, a surface of the second layer being bonded to the surface of the first layer marked with the indicia so that the indicia are encapsulated between the pair of layers.

17. The system of claim 16, wherein one of said pair of layers is an inner tie layer for improving the bond strength between the film member and the article portion, wherein the other of said pair of layers is an outer layer, and wherein said tie layer is disposed between said article portion and the outer layer.

18. The system of claim 14, wherein the indicia include electronically readable indicia.

19. The system of claim 18, wherein the electronic readable indicia include at least one bar code.

20. The system of claim 14, wherein the article portion is a portion of a wafer container.

21. The system of claim 14, wherein the article portion is a portion of a chip handling tray.

22. A method of making a plurality of articles for semiconductor material handling having electronically readable indicia marked thereon, each article including a plastic portion, each plastic portion marked with unique electronically readable indicia, the method comprising the steps of:

forming a plurality of film members from polymer film material;

marking each film member with unique, electronically readable indicia; and

sequentially molding each plastic portion for each article by:

positioning one of said plurality of film members on a shaping surface of a mold;

molding polymer material over the shaping surface of the mold and the film member to form the plastic portion, the film member being thereby permanently bonded with the plastic portion; and

ejecting the molded plastic portion from the mold.

23. The method of claim 22, wherein said article is a wafer container.

24. The method of claim 22, wherein said article is a chip handling tray.

25. A method of molding at least a portion of a plastic article for use in a semiconductor manufacturing clean room, the article portion being marked with indicia, the method comprising:

forming a film member from polymer film material, said film member having a surface;

marking the surface of the film member with indicia;

positioning the film member on a shaping surface of a mold with the surface marked with the indicia facing away from the shaping surface; and

molding polymer material over the shaping surface of the mold and the film member to form the article portion, the film member being thereby permanently bonded with the article portion.

26. The method of claim 25, further comprising the step of bonding a layer of polymer material over the surface of the film member and the indicia marked thereon.
27. The method of claim 25, further comprising the step of applying a protective coating over the surface of the film member and the indicia marked thereon.
28. The method of claim 27, wherein the step of applying a protective coating comprises applying a layer of a temperature and shear resistant ink.
29. The method of claim 27, wherein the step of applying a protective coating comprises applying a layer of optical protective material by plasma enhanced chemical vapor deposition.
30. A chip handling tray having indicia marked thereon comprising:
- a tray portion made from polymer material; and
  - a film portion molded on said tray portion, said film portion being marked with the indicia, said film portion adapted so as to form a protective containment barrier for said indicia.
31. The chip handling tray of claim 30, wherein said film portion is transparent polymer material and has an inner surface directly bonded to said tray portion, said indicia being marked on said inner surface so that said indicia are encapsulated between said film portion and said tray portion.
32. The chip handling tray of claim 31, wherein said inner surface and said indicia are coated with a layer of temperature and shear resistant ink.
33. The chip handling tray of claim 30, wherein said indicia are marked with temperature and shear resistant ink.
34. The chip handling tray of claim 30, wherein said film portion includes at least a pair of layers, a first layer having the indicia marked on a surface thereof, a second layer made from polymer film material, a surface of the second layer being bonded to the surface of the first layer marked with the indicia so that the indicia are encapsulated between the pair of layers.

35. The chip handling tray of claim 34, wherein one of said pair of layers is an inner tie layer for improving the bond strength between the film portion and the tray portion, wherein the other of said pair of layers is an outer layer, and wherein said tie layer is disposed between said tray portion and the outer layer.

36. The chip handling tray of claim 30, wherein said film portion is constructed substantially of a material selected from the group consisting of: polyester, polyimide, polyether imide, polyetheretherketone, perfluoroalkoxy resin, fluorinated ethylene propylene copolymer, polyvinylidene fluoride, polymethyl methacrylate, polyether sulfone, polystyrene, and polyphenylene sulfide.

37. The chip handling tray of claim 30, wherein the film portion is constructed substantially of polyetheretherketone.

38. The chip handling tray of claim 30, wherein the indicia are electronically readable indicia.

39. The chip handling tray of claim 38, wherein said electronically readable indicia include at least one bar code.