

SEMICONDUCTOR COMPONENT HANDLING DEVICE HAVING A PERFORMANCE FILM

The present invention claims priority to Provisional Application No. 60/333,689,
5 filed November 27, 2001, entitled PERFORMANCE POLYMER FILM INSERT
MOLDING FOR WAFER CARRIERS and is incorporated herein by reference.

Field of the Invention

The present invention relates generally to film insert molding, and more
10 particularly to insert molding a thin protective containment polymer film during the
molding of semiconductor component handlers or carriers.

Background of the Invention

Conventional film insert molding techniques are generally utilized in
15 manufacturing processes to increase aesthetic appeal in various consumer products.
Namely, decorative decals, instructions, logos, and other visual graphics are printed on
one surface of a thin transparent polymer film for use in the insert molding process. Later
developments expanded the use of the film to permanently fix functional features such as
barcodes to the products. In both circumstances, the film is placed into a portion of the
20 mold prior to the injection of the moldable material. This creates a bond between the film
and the molded part such that inexpensive decoration or indicia can be selectively placed
on the part, while at the same time simplifying the use of indicia around complicated
contours and in difficult-to-reach locations. Similarly, such film insert molding or
decorative molding simplifies the manufacturing process by eliminating the need to have
25 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 semiconductor industry introduces unique and unconventional purity and anti-contamination requirements into the development and implementation of product designs and manufacturing processes. Most importantly, material selection is essential in the manufacturing, storage, and transportation of components and assemblies. For instance, various polymer materials such as polyethylene (PE), polycarbonates (PC), perfluoroalkoxy (PFA), polyetheretherketone (PEEK), and the like are generally utilized in the manufacturing of components and structures incorporated in constructing wafer carriers and chip trays.

Wafer Carriers

The processing of wafer disks into integrated circuit chips often involves several steps where the disks are repeatedly processed, stored and transported. Due to the delicate nature of the disks and their extreme value, it is vital that they are properly protected throughout this procedure. One purpose of a wafer carrier is to provide this protection. Additionally, since the processing of wafer disks is generally automated, it is necessary for disks to be precisely positioned relative to the processing equipment for the robotic removal and insertion of the wafers. A second purpose of a wafer carrier is to securely hold the wafer disks during transport.

Carriers are generally configured to axially arrange the wafers or disks in shelves or slots, and to support the wafers or disks by or near their peripheral edges. The wafers or disks are conventionally removable from the carriers in a radial direction upwardly or laterally. Carriers may have supplemental top covers, bottom covers, or enclosures to enclose the wafers or disks. There are a number of material characteristics which are

useful and advantageous for wafer carriers depending on the type of carrier and the particular part of the carrier at issue.

During processing of semiconductor wafers or magnetic disks, the presence or generation of particulates presents very significant contamination problems.

5 Contamination is accepted as the single largest cause of yield loss in the semiconductor industry. As the size of integrated circuitry has continued to be reduced, the size of particles which can contaminate an integrated circuit has also become smaller, making minimization of contaminants all the more critical. Contaminants in the form of particles may be generated by abrasion such as the rubbing or scraping of the carrier with the
10 wafers or disks, with the carrier covers or enclosures, with storage racks, with other carriers, or with the processing equipment. A most desirable characteristic of a carrier is therefore a resistance to particle generation upon abrasion, rubbing, or scraping of the plastic molded material. U.S. Pat. No. 5,780,127 discusses various characteristics of plastics which are pertinent to the suitability of such materials for wafer carriers, and is
15 incorporated herein by reference.

Carrier materials should also have minimal outgassing of volatile components as these may leave films which also constitute a contaminant which can damage wafers and disks. The carrier materials must have adequate dimensional stability, that is rigidity, when the carrier is loaded. Dimensional stability is necessary to prevent damage to the
20 wafers or disks and to minimize movement of the wafers or disks within the carrier. The tolerances of the slots holding wafers and disks are typically quite small and any deformation of the carrier can directly damage the highly brittle wafers or increase the abrasion and thus the particle generation when the wafers or disks are moved into, out of, or within the carrier. Dimensional stability is also extremely important when the carrier is
25 loaded in some direction such as when the carriers are stacked during shipment or when

the carriers integrate with processing equipment. The carrier material should also maintain its integrity under elevated temperatures which may be encountered during storage or cleaning.

Visibility of wafers within closed containers is highly desirable and may be required by end users. Transparent plastics suitable for such containers, such as polycarbonates, are desirable in that such plastic is low in cost but such plastics may not have sufficient performance characteristics such as abrasion resistance, heat resistance, chemical resistance, outgassing containment, rigidity characteristics, creep reduction, fluid absorption containment, UV protection, and the like.

Other important considerations include the cost of the carrier material and the ease of molding the material. Carriers are typically formed of injection molded plastics such as PC, acrylonitrile butadiene styrene (ABS), polypropylene (PP), PE, PFA, PEEK, and like materials.

One major benefit of particular specialized polymers is their abrasion-resistant qualities. Typical inexpensive conventional plastics release tiny particles into the air when abraded or even when rubbed against other material or objects. While these particles are typically invisible to the naked eye, they result in the introduction of potentially damaging contaminants that may adhere to semiconductor components being processed, and into the necessarily controlled environments. However, specialized thermoplastic polymers are dramatically more expensive than conventional polymers. In fact, the various specialized thermoplastic polymers themselves can vary greatly – i.e., PEEK is more expensive than PC.

Conventional practices include constructing an entire wafer carrier/handler component of a material to obtain any one of the listed performance characteristics. As stated, however, the manufacturing and use of materials such as PEEK is dramatically

more expensive and it is often undesirable and even infeasible to utilize the material in the construction of large handler components. Additionally, PEEK can be difficult to manipulate and mold in the manner required in manufacturing such semiconductor handlers. Currently, a manufacturer of wafer carriers is forced to make a decision between
5 the benefits of functional performance characteristics of a particular thermoplastic, and the cost to manufacture all, or a substantial portion, of the product out of the material. While functional thermoplastic materials may only be needed in particular applications on particular part or component surfaces of the carrier that touch delicate semiconductor components or processing equipment, the entire section or part of the handler is typically
10 constructed of the functional polymer. As stated, this is inefficient in terms of both cost and manufacturing integrity.

As a result, there is a need in the semiconductor industry for manufacturing techniques that substantially reduce unnecessary manufacturing processes and permit targeted and localized implementation of functional thermoplastic materials to provide
15 enhanced performance characteristics at the targeted handler surface. Such an innovation would significantly reduce the costs of manufacturing and design by permitting selective use of desirable, but often expensive, thermoplastics polymers.

Summary of the Invention

20 The present invention relates generally to a system and method for including a thin protective containment thermopolymer film in the molding process for handlers, transporters, carriers, trays and like devices utilized in the semiconductor processing industry. The thermoplastic film of predetermined size and shape is selectively placed along a shaping surface in a mold cavity for alignment with a desired target surface of a
25 moldable material. The molding process causes a surface of the film to bond to a contact

surface of the moldable material such that the film is permanently adhered to the moldable material. As a result, a compatible polymer film can be selectively bonded only to those target surfaces where performance characteristics such as abrasion resistance, heat resistance, chemical resistance, outgassing containment, rigidity enhancement, hardness, creep reduction, fluid absorption containment, and the like is needed. For instance, semiconductor wafer carrier support structures can include such a polymer film along at least a portion to provide an abrasion resistance contact surface for receivably securable wafers. Further, the protective containment film can include addition film layers to comprise a film laminate for bonding to the semiconductor component handling devices, and to add polymer layers having different functional performance characteristics.

An object and feature of particular embodiments of the present invention is that it provides a cost-efficient method of selectively utilizing desirable polymers, and the polymers' corresponding functional characteristic, wherein it is not necessary to utilize more of the polymer than is required.

Another object and feature of particular embodiments of the present invention is that a functional thermoplastic film can be selectively bonded to a portion of a wafer carrier, chip tray, or other semiconductor component handler or transporter that contacts sensitive parts, components, or processing equipment.

A further object and feature of particular embodiments of the present invention is the selective use of preferred abrasion-resistant polymer films on parts being used in the semiconductor processing industry.

Still another object and feature of particular embodiments of the present invention is forming a semiconductor component handling device with a polymer filmed surface area that is transparent or translucent while still providing functional performance advancements for the selected surface. Such a handling device is formed by utilizing a

thin enough layer of a material on a selected target structure of the device, and overmolding the structure, with or without an intermediate layer, to the substantially transparent or translucent device body constructed of a material such as PC.

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Brief Description of the Drawings

Fig. 1 is a side cross-sectional view of a performance film insert molding system in accordance with an embodiment of the present invention.

Fig. 2 is a side cross-sectional view of portion of the performance film insert molding system of Fig. 1.

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Fig. 3 is a side cross-sectional view of a performance film insert molding system in accordance with an embodiment of the present invention.

Fig. 4 is a side cross-sectional view of a molded part and bonded performance film in accordance with an embodiment of the present invention.

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Fig. 5 is a side cross-sectional view of a molded part and bonded performance film laminate in accordance with an embodiment of the present invention.

Fig. 6 is a perspective view of a semiconductor wafer handling device in accordance with an embodiment of the present invention.

Fig. 7 is an exploded perspective view of a semiconductor wafer handling device in accordance with an embodiment of the present invention.

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Fig. 8 is a perspective view of stackable chip handling devices in accordance with an embodiment of the present invention.

Fig. 9 is a side cross-sectional view of stackable chip handling devices in accordance with an embodiment of the present invention.

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Detailed Description of the Preferred Embodiment

Referring to Figs. 1-9, the present invention includes insert molding at least one protective or containment thermoplastic film 10 to a selected target surface of semiconductor component handling device 12 utilizing a molding unit 20.

5 Protective/Containment Film

The at least one protective or containment film 10 is a thermoplastic polymer having a functional performance characteristic. Functional performance characteristics can include abrasion resistance, heat resistance, chemical resistance, outgassing containment, fluid absorption containment, UV protection, and the like concerns known to be considered in
10 the field of semiconductor processing. Additional functional performance characteristics can include rigidity characteristics, creep reduction, hardness, and a myriad of other dimensionally stabilizing characteristics. The film 10 is at least partially defined by a limited thickness. For instance, a single film layer thickness equal to or less than approximately .040 inches (forty thousandths) is envisioned. Preferably, the single film
15 layer is less than or equal to approximately .030 inches (thirty thousandths). Of course, the implementation of laminates of multiple layers will alter this preferred thickness criteria. Any compatible material can be utilized for the film 10 to achieve these functional performance characteristics. For example, polyester, polyimide (PI), polyether imide (PEI), PEEK, perfluoroalkoxy resin (PFA), fluorinated ethylene propylene
20 copolymer (FEP), polyvinylidene fluoride (PVDF), polymethyl methacrylate (PMMA), polyether sulfone (PES), polystyrene (PS), polyphenylene sulfide (PPS), and a myriad of other compatible polymers are available. To employ the performance enhancing film 10 in manufacturing of semiconductor component handling devices 12, the film 10 is generally cut to a predetermined shape and size depending on the particular needs of the
25 bonding application. After cutting, the film 10 can then be thermoformed. The film 10 is

generally thin and sheet-like to better facilitate moldability and to capitalize on the transparent or translucent characteristics of the material. Co-pending U.S. Application No. _____, owned by the present Applicant and entitled "SEMICONDUCTOR COMPONENT HANDLING DEVICE HAVING AN ELECTROSTATIC DISSIPATING FILM" is incorporated herein by reference in its entirety.

In addition to insert molding a single film 10, a plurality of films 10 can be laminated to comprise a composite film structure for moldable bonding to the semiconductor component handling devices 12. For instance, various film layers can include differing performance or containment characteristics listed herein, or to provide a combination thereof. A myriad of film lamination techniques known to one skilled in the film lamination art are envisioned for use with the present invention. 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.

Performance Film Insert Molding

Referring primarily to Figs. 1-7 the molding unit 20 generally includes a mold cavity 22, a cover portion 24, and at least one injection channel portion 28. The at least one injection channel 28 is in fluid communication with the mold cavity 22. The mold cavity 22 can include a shaping surface 26, or surfaces, designed to shape the injected moldable material 30 and/or the film 10 during the molding process. The cover portion 24 selectively engages or covers the mold cavity 22. Various embodiments of the molding unit 20 can further include at least one vacuum channel 29 in communication with the mold cavity 22 and/or the shaping surface 26 to introduce vacuum suction in securing an object, such as the film 10, to the mold cavity 22. Other known techniques for securably conforming the film 10 within the cavity 22 and shaping surface 26 employing static securement and forceable engagement are also envisioned for use with the present

invention. It should be noted that various figures depict the film 10 as disproportionately large in comparison to the corresponding handling devices for illustrative purposes only and is not intended to represent actual proportions for the present invention.

In one embodiment, the cover portion 24 is removably securable to the mold cavity 22 to facilitate film 10 insertion, and removal of the finished handling device portion or part 32. The molded part 32 is generally something less than a completed handling device 12. For example, it is common for sidewall inserts and shelves of wafer carriers to be separately molded, and often to be molded of dissimilar plastics in comparison to the main body of the carrier. Various injection and insert molding techniques are commonly known to those skilled in the art and can be implemented without deviating from the spirit or scope of the present invention.

The moldable material 30 is preferably a substantially non-conductive thermoplastic material commonly used in molding parts for any handling device used in the semiconductor processing industry. Again, the material 30 can be PFA, PE, PC, and like known materials. More specifically, the moldable material 30 can be the material conventionally used to construct wafer carriers, chip trays, and components and parts thereof.

In operation, the performance film 10 is generally cut to a predetermined shape and then thermoformed to a required form. The thermoformed film 10 is placed into the molding unit 20 such that the film 10 is in surface contact with at least a portion of the at least one shaping surface 26 of the mold cavity 22. As indicated herein, various techniques such as vacuum, static, and forceable securement can be implemented to facilitate proper positioning of the film 10 to the cavity 22 or the shaping surface 26. The cover portion 24 may then be closed in preparation for injection of the material 30. At this stage of the process, the moldable material 30 is injected in a substantially molten state

into the cavity through the at least one injection channel 28. After waiting a requisite cooling period, the moldable material 30 within the molding unit 20 cools to form the substantially solidified molded part 32. The molten injection combined with the cooling process forms a permanent adhering bond between the at least one film 10 and the molded part 32.

After completion of the molding process, the molded part 32 can be ejected from the molding unit 32 with the part 32 having a performance enhancing film 10 permanently bonded to a selective target surface. Conventional tooling, techniques, and practices known by those skilled in the art can be used in injecting the material 30 and ejecting the part 32.

Wafer Handler/Carrier

Various conventional wafer handling devices 34 and device 34 components or parts are shown in Figs. 4-7. The film 10 or film laminate can be bonded to selective components and/or portions of the wafer handling device 34 (i.e., wafer carrier) with the film insert molding processes described herein. Wafer handlers 34 are generally formed from at least two different melt processable materials. Consequently, once a part 32 of the wafer handler 34 has been injection molded as described, it is often necessary to later place the part 32 in a second mold cavity for overmolding with another molded part or component of the wafer handler 34. This is yet another reason why it is necessary to have a film 10 made of a durable polymer plastic. Repeated exposure to the shear forces and high temperatures of molding processes requires use of a preferred thermopolymer. Copending 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.

U.S. Patent Nos. 6,428,729 6,039,186, 5,485,094, and 5,944,194, and disclose particular configurations and processes for constructing wafer handling devices 34, and are incorporated herein by reference. In one embodiment the wafer handler 34 includes at least a body portion 38, and a support structure 40 having a plurality of axial support shelves 42 capable of receivably supporting the wafers or disks by, or near, their peripheral edges. The wafers or disks are conventionally removable from the carriers 34, at the shelves 42, in a radial direction upwardly or laterally. The shelves 42 serve as the primary point of contact between the wafers and the carrier 34. As a result, one embodiment of the present invention includes insert molding a protective film 10 to at least a portion of this support structure 40 and/or the supporting shelves 42. The protective film 10 can be selectively placed within the mold cavity 22 of the molding unit 20 such that it covers an entire surface or side of the molded part, wherein the molded part 32 is the support 40, the support shelves 42, a limited predefined portion of the shelves 42, or various other combinations. Further, the film 10 can be specifically bonded for alignment with other adjacent and abutable components of the wafer handler 23 to provide for extended protection. By advancing selective bondable placement of the film 10 to nearly any surface or component surface of the wafer handler 34 to introduce or increase abrasion resistance, heat resistance, chemical resistance, outgassing containment, UV protection, rigidity characteristics, creep reduction, hardness, fluid absorption containment, and the like

In other embodiments of the present invention, the wafer handler 34 can include flanges 44 (Fig. 6) along the outside portion of the handler body 38 to facilitate transporting, including engagement by robotic equipment during semiconductor processing. These flanges 44 can similarly include the insert molded performance film 10 to promote abrasion-resistance. As such, the remaining portions and surfaces of the body

38 can be constructed of less expensive less functional polymers. Still further embodiments can included the molded protective film 10 at selected surfaces of a kinematic coupling structure 46, wherein the kinematic coupling 46 (Fig. 7) is adapted to facilitate equipment engagement with the handling device 34 as described in U.S. Patent
5 No. 6,010,008.

In certain instances, the insert molded performance film 10 may not adhere sufficiently to other polymers. For example, PEEK (i.e., film 10) does not adhere in all cases to overmolded PC (i.e., wafer handler 34 components such as the body 38). Referring to Fig. 5, it has been found that an intermediate film, or tie layer, such as PEI
10 adheres to both the PEEK and PC material. Thus, a film laminate 10 of at least two polymer films may be inserted individually in a mold, as a laminate, before injecting the PC material with the intermediate film being positioned intermediate the film 10 and the molten moldable PC material 30. Alternatively, the two films may be adhered to one another, such as by vacuum molding, lamination processes as described herein, or by other
15 means wherein the two layers or films are bonded prior to insertion and positioning within the molding unit 20.

With such selective bonding of the at least one performance or functional film 10, selective use of specific materials at specific target surface and handler components is possible. This selective targeting promotes manufacturing and costs efficiencies as the
20 desired or even required film 10 material may be quite different than what is needed in the construction of the remainder of the wafer carrier 34, or even the specific part 32.

Chip Handler/Tray

In another embodiment, the handling device 12 is a chip tray 36 including a plurality of seating recesses 50 or recess assemblies adapted to secure a plurality of chips,
25 and peripheral side walls 52, as shown in Figs. 8-9. U.S. Patent Nos. 5,484,062 and

6,079,565 disclose such chip trays and are incorporated herein by reference. As with the processes and material described herein for the wafer handlers 34, it is beneficial to introduce or enhance the functional performance characteristics of specific surface or portions of the trays 36. For instance, an abrasion resistant film 10 bonded to the seating
5 recesses 50 will minimize potential particulate distribution from the contact and rubbing caused by often frequent seating of the chips.

One embodiment of the present invention includes insert molding the performance film 10 to a selected portion or surface of the chip tray 36, such as the seating recesses 50. Other embodiments can include insert molding the film 10 to the entire top surface of the
10 tray 36 including the recesses 50, the side walls 52, and combinations thereof. For instance, the film 10 can be selectively bonded to portions of the side walls 52 to enhance abrasion resistance from contact or engagement with processing equipment or automated machinery and robotics.

Further, the peripheral side walls 52 of the chip trays 36 are generally shaped for
15 stackable engagement with other chip trays 36. Stacking posts/members and/or peripheral wall ledges on the bottom portion of the trays 36 can be sized and shaped for alignment with corresponding grooves or lips on the top surfaces of the trays 36. Other stacking techniques and tray designs known to one skilled in the art are also envisioned for implementation with the present invention. To provide a layer of protection, film 10 can
20 be molded to the stackable engagement regions of the peripheral side walls 52.

As with the wafer handlers 34, selective bonding of the at least one protective performance film 10 to selected target surfaces of the chip tray 36 provides a preferred employment of performance enhancing thermoplastics while still allowing a manufacturer to construct the remaining portions of the tray 36 of other preferred polymers.

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

1. A semiconductor wafer handling device, comprising:
at least one substantially rigid thermoplastic component structure making up a part of the wafer handling device; and
at least one protective thermoplastic film bonded to a portion of the at least one thermoplastic component structure using an insert molding process to introduce containment characteristics to the semiconductor wafer handling device;
2. The device of claim 1, wherein the at least one protective thermoplastic film includes a film having containment characteristics selected from a group consisting of: abrasion resistance, chemical resistance, heat resistance, ultraviolet protection, fluid absorption barrier characteristics, and outgassing barrier characteristic.
3. The device of claim 2, wherein the at least one protective thermoplastic film is a film laminate having at least two film layers such that at least one of the at least two film layers is the protective film.
4. The device of claim 3, wherein the at least two film layers each have different containment characteristics.
5. The device of claim 3, wherein at least one of the at least two film layers is an intermediate tie layer for improving the bond strength between the protective film and the at least one thermoplastic component structure.

6. The device of claim 1, wherein the at least one thermoplastic component structure is a support structure having a plurality of spaced support shelves adapted to receive semiconductor wafers.
7. The device of claim 1, wherein the at least one thermoplastic component structure is a kinematic coupling adapted for mechanical communication with semiconductor processing equipment.
8. The device of claim 1, wherein the at least one thermoplastic component structure is a handling flange adapted for selective engageable communication with a robotic device.
9. The device of claim 1, wherein the at least one thermoplastic component structure is a body shell portion of the wafer handling device.
10. The device of claim 1, wherein the at least one protective thermoplastic film is substantially translucent.
11. The device of claim 1, wherein the at least one protective film 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.

12. The device of claim 1, wherein the at least one protective film is constructed substantially of polyetheretherketone.
13. A device for handling semiconductor components, comprising:
a first substantially rigid thermoplastic portion of the handling device; and
at least one thermoplastic containment film bonded to at least a portion of the first thermoplastic component by way of a film insert molding process, wherein the thermoplastic containment film provides protection for the sensitive semiconductor components during semiconductor component processing.
14. The device of claim 13, wherein the first thermoplastic portion is a portion of a semiconductor wafer handling device, the wafer handling device including a body shell, and a wafer support structure for receiving semiconductor wafers.
15. The device of claim 14, wherein the at least one thermoplastic containment film is bonded to at least a portion of the wafer support structure to minimize the dispersement of damaging particulates into the air.
16. The device of claim 13, wherein the first thermoplastic portion is a portion of a semiconductor chip handling tray, the tray including a plurality of recesses adapted to receive semiconductor chips, and a plurality of peripheral side wall sections.
17. The device of claim 16, wherein at least one of the peripheral side wall sections is adapted for matable stackable engagement with a separate semiconductor chip handling device.

18. The device of claim 17, wherein the at least one containment film is bonded to a plurality of the recesses and to the at least one of the peripheral side wall sections to minimize the dispersement of damaging particulates into the air.

19. The device of claim 13, wherein the at least one containment film is a film laminate comprising a plurality of film layers, wherein at least one of the film layers is the containment film.

20. The device of claim 19, wherein each of the film layers of the film laminate have distinct protective characteristics.

21. The device of claim 20, wherein each of the film layers of the film laminate have distinct protective characteristics, each selected from the group consisting of: abrasion resistance, chemical resistance, heat resistance, ultraviolet protection, fluid absorption barrier characteristics, and outgassing barrier characteristic.

22. The device of claim 13, wherein the at least one containment film has a protective characteristic selected from the group consisting of: abrasion resistance, chemical resistance, heat resistance, ultraviolet protection, fluid absorption barrier characteristics, and outgassing barrier characteristic.

23. The device of claim 13, wherein the at least one containment film 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.

24. The device of claim 13, wherein the at least one containment film is constructed substantially of polyetheretherketone.

25. A method of film insert molding an semiconductor handling device component through meltably bonding of at least one containment thermoplastic film to at least a portion of a thermoplastic material, comprising the steps of:

forming at least one containment thermoplastic film;

accessing a molding unit having a mold cavity, the mold cavity including at least one shaping surface;

positioning the at least one formed containment thermoplastic film within the cavity of the molding unit along at least a portion of the at least one shaping surface;

injecting a substantially molten thermoplastic material into the cavity of the molding unit to conform to the shape of the at least one shaping surface;

waiting a cooling period wherein the thermoplastic material substantially solidifies to matably bond with the at least one containment thermoplastic film to generate a protective containment surface on the semiconductor handling device component; and

ejecting the semiconductor handling device component from the molding unit.

26. The method of claim 25, wherein the molding of the semiconductor handling device component forms a component part of a semiconductor wafer handling device.

27. The method of claim 26, wherein the molding of the semiconductor handling device component forms a support structure of the semiconductor wafer handling device, the support structure having a plurality of spaced support shelves, wherein the at least one containment thermoplastic film is bonded to a portion of the spaced support shelves.

28. The method of claim 25, wherein the molding of the semiconductor handling device component forms a component part of a semiconductor chip handling tray having a plurality of chip receiving recesses, wherein the at least one containment thermoplastic film is bonded to the plurality of chip receiving recesses to minimize the release of particulates into the air during use.

29. The method of claim 25, wherein the molding of the semiconductor handling device component forms a component part of a semiconductor chip handling tray having a plurality of chip receiving recesses and peripheral side walls, wherein the at least one containment thermoplastic film is bonded to at least a portion of the peripheral side walls to minimize the release of particulates into the air during use.

30. The method of claim 25, wherein forming the at least one containment thermoplastic film includes thermoforming a multi-layer film laminate wherein at least one of the film layers is a containment thermoplastic film.

31. The method of claim 30, wherein the multi-layer film laminate includes at least two film layers, wherein a first one of the at least two film layers has a containment characteristic different than a second one of the at least two film layers.

32. The method of claim 25, wherein forming the at least one containment thermoplastic film includes forming a substantially translucent at least one containment thermoplastic film.

33. The method of claim 25, wherein the at least one containment film has a protective characteristic selected from the group consisting of: abrasion resistance, chemical resistance, heat resistance, ultraviolet protection, fluid absorption barrier characteristics, and outgassing barrier characteristic.

34. The method of claim 25, wherein forming the at least one containment thermoplastic film includes forming the at least one containment film substantially constructed 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.

35. The method of claim 25, wherein forming the at least one containment thermoplastic film includes forming the at least one containment film substantially constructed of a polyetheretherketone material.

36. A semiconductor chip handling tray, comprising:
a plurality of recessed portions capable of receiving semiconductor components;
an outside perimeter wall portion adapted to promote stackability with other semiconductor chip handling trays; and

at least one containment thermoplastic film adheringly bonded with an insert molding process to a plurality of the recessed portions to provide surface protection during use.

37. The chip handling tray of claim 36, wherein the at least one containment thermoplastic film is further molded to at least a portion of the outside perimeter wall portion of the chip handling tray to minimize release of particulates into the air during use.

38. The chip handling tray of claim 36, wherein the at least one containment film has a protective characteristic selected from the group consisting of: abrasion resistance, chemical resistance, heat resistance, ultraviolet protection, fluid absorption barrier characteristics, and outgassing barrier characteristic.

39. The chip handling tray of claim 36, wherein the at least one containment film is substantially translucent.

40. The chip handling tray of claim 36, wherein the at least one containment film 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.

41. The chip handling tray of claim 36, wherein the at least one containment film is constructed substantially of polyetheretherketone.

42. A film insert molding system for molding at least a portion of a semiconductor component handling device with at least one containment film, comprising:

a quantity of substantially molten thermoplastic material for shaping at least a portion of the semiconductor handling device;

a molding unit having a molding cavity and at least one shaping surface, the molding cavity and the at least one shaping surface adapted to receive the quantity of substantially molten thermoplastic material; and

at least one containment film insertable within the molding cavity along at least a portion of the at least one shaping surface for permanent bonding to the quantity of substantially molten thermoplastic material during the molding process.

43. The system of claim 42, wherein the at least one containment film has a protective characteristic selected from the group consisting of: abrasion resistance, chemical resistance, heat resistance, ultraviolet protection, fluid absorption barrier characteristics, and outgassing barrier characteristics.

44. The system of claim 42, wherein the at least one containment film is substantially translucent.

45. The system of claim 42, wherein the at least one containment film 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.

46. The system of claim 42, wherein the at least one containment film is constructed substantially of polyetheretherketone.
47. A device for handling semiconductor components, comprising:
a first thermoplastic portion of the handling device; and
at least one thermoplastic dimensionally stabilizing film bonded to at least a portion of the first thermoplastic component by way of a film insert molding process.
48. The device of claim 47, wherein the at least one thermoplastic dimensionally stabilizing film reduces creep for the at least a portion of the first thermoplastic portion.
49. The device of claim 47, wherein the at least one thermoplastic dimensionally stabilizing film provides increased rigidity benefits for the at least a portion of the first thermoplastic portion.
50. The device of claim 47, wherein the at least one thermoplastic dimensionally stabilizing film provides increased hardness benefits for the at least a portion of the first thermoplastic portion.
51. The device of claim 47, wherein the at least one dimensionally stabilizing film 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.

52. The device of claim 47, wherein the at least one dimensionally stabilizing film is constructed substantially of polyetheretherketone.