

ECLA EUROPEAN CLASSIFICATION

B81C PROCESSES OR APPARATUS SPECIALLY ADAPTED FOR THE MANUFACTURE OR TREATMENT OF MICRO-STRUCTURAL DEVICES OR SYSTEMS (making microcapsules or microballoons [B01J13/02](#); processes or apparatus peculiar to the manufacture or treatment of piezo-electric, electrostrictive or magnetostrictive element per se [H01L41/22](#))

Note

This subclass does not cover:

- processes or apparatus for the manufacture or treatment of purely electrical or electronic devices, which are covered by section H, e.g. group [H01L21/00](#);
- processes or apparatus involving the manipulation of single atoms or molecules, which are covered by group [B82B3/00](#).

[N: **Note** [N1108]

In this subclass, local "residual" subgroups, e.g. [B81C1/00C2Z](#), are used with the following purpose.

When classifying a document which does not fit in any of a set of subgroups with the same dot-level, the document should be classified in the residual group, if present, and not in the group at the hierarchical level one dot above.

In the example, the document shall be classified in [B81C1/00C2Z](#) and not in [B81C1/00C2](#) as [B81C1/00C2Z](#) is "residual" to [B81C1/00C2A-B81C1/00C2W](#)

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B81C1/00 Manufacture or treatment of devices or systems in or on a substrate ([B81C3/00](#) takes precedence) [N9803]

B81C1/00A . [N: Assembling automatically hinged components, i.e. self-assembly processes (self-assembly mechanisms [B81B7/00A](#))] [N0608] [C0701]

B81C1/00C . [N: for manufacturing micro-systems] [N0706]

B81C1/00C2 . . [N: without movable or flexible elements (array of static structures for functionalising surfaces in [B81C1/00C8](#); manufacture of MEMS devices for specific applications, see relevant places, e.g. microreactors [B01J19/00R](#), lab-on-chip [B01L3/00C6M](#), micromixers [B01F13/00M](#))] [N0706] [C1101]

B81C1/00C2A . . . [N: Regular or irregular arrays of nanoscale structures, e.g. etch mask layer (photomechanical, e.g. photolithographic, production of textured or patterned surfaces [G03F7/00](#); lithographic processes for making patterned surfaces using printing and stamping [G03F7/00A](#))] [N0902]

B81C1/00C2B . . . [N: Anchors] [N1008]

B81C1/00C2C . . . [N: Cavities] [N0706]

B81C1/00C2G . . . [N: Grooves][N0706]

B81C1/00C2G2 [N: Trenches] [N0706]

B81C1/00C2G4 [N: Channels] [N0706]

B81C1/00C2G10 [N: Grooves not provided for in groups [B81C1/00C2G2](#) to [B81C1/00C2G4](#)] [N0706]

B81C1/00C2H . . . [N:Holes] [N0706]

- B81C1/00C2L . . . [N: Interconnects] [N0809]
- B81C1/00C2S . . . [N: Structures having a predefined profile, e.g. sloped or rounded grooves] [N0902]
- B81C1/00C2T . . . [N: Tips, pillars, i.e. raised structures ([microneedles A61M37/00M](#))] [M1206]
- B81C1/00C2W . . . [N: Arrangement of basic structures like cavities or channels, e.g. suitable for microfluidic systems] [N0706] [C1101]
- B81C1/00C2Z . . . [N: Static structures not provided for in groups [B81C1/00C2A](#) to [B81C1/00C2W](#)] [N0706] [C0902]
- B81C1/00C4 . . . [N: comprising flexible or deformable structures ([manufacture of MEMS devices for specific applications, see relevant places, e.g. gyroscopes G01C19/56G1, pressure sensors G01L9/00D1, accelerometers G01P15/08A, acoustic transducers or diaphragms therefor H04R31](#))] [N0706] [C1101]
- B81C1/00C4B . . . [Bridges ([deformable micro-mirrors G02B26/08M4E](#))] [N0706] [C1101]
- B81C1/00C4C . . . [Cantilevers ([switches using MEMS H01H1/00M](#); [electrostatic relays using micromechanics H01H59/00B](#); [micro-electro-mechanical resonators H03H9/02M](#))] [N0706] [C1101]
- B81C1/00C4D . . . [Diaphragms, membranes ([manufacture process for semi-permeable inorganic membranes B01D67/00M](#))] [N0706] [C1101]
- B81C1/00C4E . . . [N: Electrodes] [N0906]
- B81C1/00C4S . . . [N: See-saws] [N0706]
- B81C1/00C4T . . . [N: Arrangements of deformable or non-deformable structures, e.g. membrane and cavity for use in a transducer] [N0706] [C1101]
- B81C1/00C4Z . . . [N: Flexible or deformable structures not provided for in groups B81C1/00C4B to B81C1/00C4T] [N0706]
- B81C1/00C6 . . . [N: comprising elements which are movable in relation to each other, e.g. comprising slidable or rotatable elements] [N0706] [C0711]
- B81C1/00C8 . . . [N: Processes for functionalising a surface, e.g. provide the surface with specific mechanical, chemical or biological properties] [N0706]
- B81C1/00C10 . . . [N: Processes for the simultaneous manufacturing of a network or an array of similar micro-structural devices] [N0706]
- B81C1/00C12 . . . [N: Integrating an electronic processing unit with a micromechanical structure] [M1206]
- B81C1/00C12B . . . [N: Packaging together an electronic processing unit die and a micromechanical structure die ([MEMS packages B81B7/00P](#); [MEMS packaging processes B81C1/00C14](#))] [M1206]
- B81C1/00C12D . . . [N: Joining a substrate with an electronic processing unit and a substrate with a micromechanical structure] [M1206]
- B81C1/00C12F . . . [N: Monolithic integration, i.e. micromechanical structure and electronic processing unit are integrated on the same substrate] [M1206]
- B81C1/00C12Z . . . [N: Processes for integrating an electronic processing unit with a micromechanical structure not provided for in [B81C1/00C12B](#) to [B81C1/00C12F](#)] [M1206]
- B81C1/00C14 . . . [N: Processes for packaging MEMS devices ([MEMS packages B81B7/00P](#), [packaging of smart-MEMS B81C1/00C12B](#))] [N0706] [C0711]
- B81C1/00C14B . . . [N: Bonding of solid lids or wafers to the substrate] [M1206]
- B81C1/00C14C . . . [N: for maintaining a controlled atmosphere inside of the cavity containing the MEMS] [N0706]
- B81C1/00C14C2 . . . [N: using materials for controlling the level of pressure, contaminants or moisture inside of the package, e.g. getters] [N0803] [C0904]

- B81C1/00C14C10 [N: maintaining a controlled atmosphere with processes not provided for in [B81C1/00C14C2](#)] [N0803]
- B81C1/00C14E [N: Connecting electric signal lines from the MEMS device with external electrical signal lines, e.g. through vias] [N0706]
- B81C1/00C14H [N: suitable for fluid transfer from the MEMS out of the package or vice-versa, e.g. transfer of liquid, gas, sound] [N0902]
- B81C1/00C14P [N: Packaging optical devices] [N0803]
- B81C1/00C14S [N: for reducing stress inside of the package structure] [N0803]
- B81C1/00C14Z [N: Aspects relating to packaging of MEMS devices, not covered by groups [B81C1/00C14B](#) to [B81C1/00C14S](#)] [N0706] [C0803]
- B81C1/00C20 [N: Processes for manufacturing micro-systems not provided for in groups B81C1/00C2 to B81C1/00C14] [N0706]

- B81C1/00D [N: Creating layers of material on a substrate] [C1206]
- B81C1/00D2 [N: involving bonding one or several substrates on a non-temporary support, e.g. another substrate] [C1206]
- B81C1/00D6 [N: having low tensile stress between layers] [N1206]
- B81C1/00D8 [N: Selective deposition, e.g. printing or micro-contact printing] [N1206]
- B81C1/00D99 [N: Processes for creating layers of materials not provided for in groups B81C1/00D2 to B81C1/00D8] [N1206]

- B81C1/00E [N: Etch mask forming] [C1206]
- B81C1/00E6 [N: Mask characterised by its composition, e.g. multilayer masks] [N1206]
- B81C1/00E8 [N: Mask characterised by its size, orientation or shape] [N1206]
- B81C1/00E12 [N: Mask characterised by its behaviour during the etching process, e.g. soluble masks] [N1206]
- B81C1/00E14 [N: Compensation masks in orientation dependent etching] [N1206]
- B81C1/00E99 [N: Etch mask forming processes not provided for in groups B81C1/00E6 to B81C1/00E14] [N1206]

- B81C1/00F [N: Shaping materials, i.e. techniques for structuring the substrate or the layers on the substrate] [M1206]
- B81C1/00F2 [N: Surface micromachining, i.e. structuring layers on the substrate] [N9807] [C0706]
- B81C1/00F2F [N: using stamping, e.g. imprinting (nano-imprinting for making etch masks [G03F7/00A](#))] [C1206]
- B81C1/00F2R [N: Releasing structures] [N0706]
- B81C1/00F2R2 [N: removing a sacrificial layer ([B81C1/00S](#) takes precedence)] [N0706] [C0711]
- B81C1/00F2R10 [N: Processes for releasing structures not provided for in group B81C1/00F2R2] [N0706]
- B81C1/00F2Z [N: Processes for surface micromachining not provided for in groups [B81C1/00F2D](#) to [B81C1/00F2R10](#)] [C1206]
- B81C1/00F4 [N: Bulk micromachining] [N0706]
- B81C1/00F4B [N: Formation of buried layers by techniques other than deposition, e.g. by deep implantation of elements (SIMOX techniques H01L21/762)] [N1206]
- B81C1/00F4Z [N: Bulk micromachining techniques not provided for in B81C1/00F4B] [N1206]
- B81C1/00F6 [N: Etching material] [N0706]

- B81C1/00F6D . . . [N: Dry etching] [N0706]
- B81C1/00F6E . . . [N: Wet etching] [N0706]
- B81C1/00F6Z . . . [N: Etching processes not provided for in groups B81C1/00F6D to B81C1/00F6P] [N0706]
- B81C1/00F8 . . [N: Achieving a desired geometry, i.e. controlling etch rates, anisotropy or selectivity (B81C1/00C2 to B81C1/00C4Z take precedence)] [N1206]
- B81C1/00F8B . . . [N: Avoid or control over-etching] [N1206]
- B81C1/00F8B2 [N: Avoid or control under-cutting] [N1206]
- B81C1/00F8B4 [N: Avoid charge built-up] [N1206]
- B81C1/00F8B99 [N: Processes for avoiding or controlling over-etching not provided for in B81C1/00F8B2 to B81C1/00F8B4] [N1206]
- B81C1/00F8G . . . [N: Control etch selectivity] [N1206]
- B81C1/00F8K . . . [N: Aligning features and geometries on both sides of a substrate, e.g. when double side etching] [N1206]
- B81C1/00F8P . . . [N: Processes for the planarisation of structures (planarising depositions C23C, H01L)] [N1206]
- B81C1/00F8R . . . [N: Forming high aspect ratio structures having deep steep walls] [N1206]
- B81C1/00F8Z . . . [N: Processes for achieving a desired geometry not provided for in groups B81C1/00F8B to B81C1/00F8R] [N1206]
- B81C1/00F10 . . [N: Processes for shaping materials not provided for in groups [B81C1/00F2](#) to [B81C1/00F8Z](#)] [C1206]

- B81C1/00G . . [N: for improving the physical properties of a device] [N0706]
- B81C1/00G2 . . [N: Mechanical properties] [N0706] [C0711]
- B81C1/00G2B . . . [N: Treatments for improving the stiffness of a vibrating element] [N0711]
- B81C1/00G2S . . . [N: Treatments for controlling internal stress or strain in MEMS structures] [N0711]
- B81C1/00G2W . . . [N: Treatments for improving wear resistance] [N0711]
- B81C1/00G2Z . . . [N: Treatments for improving mechanical properties, not provided for in [B81C1/00G2B](#) to [B81C1/00G2](#)] [N0711]
- B81C1/00G4 . . . [N: Thermal properties, e.g. improve thermal insulation] [N0706]
- B81C1/00G8 . . . [N: Electrical characteristics, e.g. by doping materials] [N0803] [C1004]
- B81C1/00G12 . . . [N: Magnetic properties] [N1112]
- B81C1/00G99 . . . [N: Treatment for improving the physical properties not provided for in groups [B81C1/00G2](#) to [B81C1/00G12](#)] [N1112]

- B81C1/00L . . [N: Preserve existing structures from alteration, e.g. temporary protection during manufacturing] [N1206]
- B81C1/00L2 . . [N: Avoid chemical alteration, e.g. contamination, oxidation or unwanted etching (B81C1/00F8B to B81C1/00F8G take precedence)] [N1206]
- B81C1/00L2C . . . [N: Avoid contamination, e.g. absorption of impurities or oxidation] [N1206]
- B81C1/00L2E . . . [N: Avoid alteration of functional structures by etching, e.g. using a passivation layer or an etch stop layer (B81C1/00F8G, B81C1/00F2R take precedence)] [N1206]
- B81C1/00L2Z . . . [N: Methods to avoid chemical alteration not provided for in groups B81C1/00L2C to B81C1/00L2E] [N1206]
- B81C1/00L4 . . [N: Avoid thermal destruction] [N1206]

- B81C1/00L6 . . [N: Protect against mechanical threats, e.g. against shocks, or residues (B81C1/00C14 take precedence)] [N1206]
- B81C1/00L99 . . [N: Methods for preserving structures not provided for in groups B81C1/00L2 to B81C1/00L6] [N1206]
- B81C1/00M . [N: Cleaning during or after manufacture (cleaning of semiconductor devices H01L21/306)] [N9807]
- B81C1/00M2 . . [N: during manufacture] [N9807]
- B81C1/00M4 . . [N: after manufacture, e.g. back-end of the line process] [N9807]
- B81C1/00P . [N: Multistep processes for the separation of wafers into individual elements] [N9807]
- B81C1/00P2 . . [N: characterised by special arrangements of the devices, allowing an easier separation] [N9807]
- B81C1/00P4 . . [N: Separation allowing recovery of the substrate or a part of the substrate, e.g. epitaxial lift-off] [N9807]
- B81C1/00P6 . . [N: Multistep processes involving only mechanical separation, e.g. grooving followed by cleaving] [N9807]
- B81C1/00P8 . . [N: Temporary protection during separation into individual elements] [N1206]
- B81C1/00P10 . . [N: Multistep processes for the separation of wafers into individual elements not provided for in groups [B81C1/00P2](#) to [B81C1/00P8](#)] [C1206]
- B81C1/00S . [N: Treatments or methods for avoiding stiction of flexible or moving parts of MEMS] [N0608] [C1105]
- B81C1/00S2 . . [N: For avoiding stiction during the manufacturing process of the device, e.g. during wet etching] [N0608]
- B81C1/00S2B . . . [N: Eliminating or avoiding remaining moisture after the wet etch release of the movable structure] [N1105]
- B81C1/00S2D . . . [N: Releasing the movable structure without liquid etchant] [N1105]
- B81C1/00S2F . . . [N: Maintaining a critical distance between the structures to be released] [N1105]
- B81C1/00S2Z . . . [N: Treatments or methods for avoiding stiction during the manufacturing process not provided for in groups [B81C1/00S2B](#) to [B81C1/00S2F](#)] [N1105]
- B81C1/00S4 . . [N: For avoiding stiction when the device is in use, i.e. after manufacture has been completed] [N0608] [C1105]
- B81C1/00S4B . . . [N: Methods for breaking the stiction bond] [N1105]
- B81C1/00S4C . . . [N: Control methods for avoiding stiction, e.g. controlling the bias voltage] [N1105]
- B81C1/00S4Z . . . [N: Methods for avoiding stiction when the device is in use not provided for in groups [B81C1/00S4B](#) to [B81C1/00S4C](#)] [N1105]
- B81C1/00S99 . . [N: Treatments or methods for avoiding stiction of flexible or moving parts of MEMS not provided for in groups [B81C1/00S2](#) to [B81C1/00S4Z](#)] [N1105]
- B81C3/00** **Assembling of devices or systems from individually processed components** [N9803]
- B81C3/00B . [N: Bonding of two components] [N0605]
- B81C3/00D . [N: Aligning micro-parts] [N0605]
- B81C3/00D2 . . [N: Active alignment, i.e. moving the elements in response to the detected position]

- of the elements using internal or external actuators] [N1112]
- B81C3/00D4 . . [N: Passive alignment, i.e. without a detection of the position of the elements or using only structural arrangements or thermodynamic forces] [N1112]
- B81C3/00D99 . . [N: Methods for aligning micro-parts not provided for in groups [B81C3/00D2](#) to [B81C3/00D4](#)] [N1112]
- B81C3/00Z . [N: Aspects related to assembling from individually processed components, not covered by groups B81C3/00B to B81C3/00D] [N0605]
- B81C99/00** **Subject matter not provided for in other groups of this subclass** [N1004]
- B81C99/00A . [N: Apparatus specially adapted for the manufacture or treatment of micro-structural devices or systems, or methods for manufacturing the same] [N1111]
- B81C99/00A2 . . [N: for cutting, cleaving or grinding] [N1111]
- B81C99/00A4 . . [N: for micro extrusion (**extrusion heads in general [B29C47/12](#)**)] [N1111]
- B81C99/00A6 . . [N: Apparatus for assembling MEMS, e.g. micro-manipulators (**micro-manipulators per se [B25J7/00](#)**)] [N1111]
- B81C99/00A99 . . [N: Apparatus specially adapted for the manufacture or treatment of micro-structural devices or systems not provided for in [B81C99/00A2](#) to [B81C99/00A6](#)] [N1111]
- B81C99/00C . [N: Characterising MEMS devices, e.g. measuring and identifying electrical or mechanical constants] [N1004]
- B81C99/00L . [N: Testing] [N1004]
- B81C99/00L2 . . [N: during manufacturing] [N1004]
- B81C99/00L4 . . [N: End test of the packaged device] [N1004]
- B81C99/00L6 . . [N: Test apparatus] [N1004]
- B81C99/00P . [N: Manufacturing logistics] [N1004]
- B81C99/00P3 . . [N: Design; Simulation] [N1004]
- B81C99/00P5 . . [N: Process control; Yield prediction] [N1004]
- B81C99/00P7 . . [N: Marking] [N1004]
- B81C99/00R . [N: Manufacture of substrate-free structures] [N1004] [M1107]
- B81C99/00R2 . . [N: separating the processed structure from a mother substrate] [N1004]
- B81C99/00R4 . . [N: using moulds and master templates, e.g. for hot-embossing] [C1206]
- B81C99/00R6 . . [N: Manufacturing the stamps or the moulds] [N1004]
- B81C99/00R10 . . [N: Aspects relating to the manufacture of substrate-free structures, not covered by groups [B81C99/00R2](#) to [B81C99/00R6](#)] [N1004] [M1107]