

CREATE
THE
DIFFERENCE



CREATING QUALITY PHARMACEUTICAL AND COSMETIC ALUMINIUM CAPS, CLOSURES AND COMPONENTS

When it comes to creating caps, closures, or components for the pharmaceutical and cosmetics industries, aluminium is a valuable metal. Using aluminium can add a dynamic visual effect to a product. As well as being able to be formed into a wide variety of shapes and sizes, this eco-friendly material is also one of the most recycled on the market today. This guide discusses how brand owners and designers can get the best out of their choice of aluminium for caps, closures and components and overcome some of the common problems associated with fabricating this unique material.

Aluminium forming

A common fabrication method used for creating shaped aluminium for caps, closures and components is deep drawing. Extremely high forces are required to push the sheet or blank of alloy into a draw cavity. The benefit is a seamless product, however the deeper the draw the less suitable it is to anodise the aluminium in advance. Also, colour, printing, embossing, durability requirements and finish all have their part to play in dictating the choice of aluminium alloy and whether it should be anodised or lacquered before or after forming.

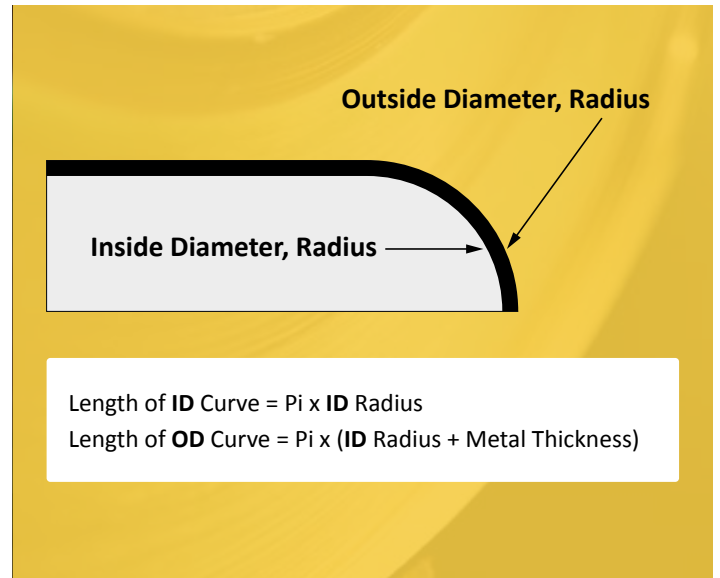


Forming anodised aluminium

Forming of pre-anodised aluminium can work well for small pressings with a slight curve. However, for deep drawn cylindrical shapes (from approximately 25mm) micro fracturing of the anodic layer occurs when the metal is formed into a 3D shape. This is because the anodic film does not stretch as much as the aluminium underneath it.

Called anodised aluminium crazing, this effect can be eliminated if the fabricated part is batch anodised after forming. Alternatively, if using pre-anodised material is preferred due to cost or time constraints, then decreasing the bend radius of the item can confine the crazing to the edge of the formed sheet or part. When it comes to caps and closures, the crazed area of the bend is often hidden as the light reflects off the bend radius.

A decrease in the anodic film's thickness will also help reduce the amount of visible crazing, as will choosing darker anodised aluminium colours and surface finishes.



Choice of aluminium

The grade selection of aluminium and the temper of each alloy can have significant impact on the end products look and feel.

Grade selection:

Aluminium alloy series	Properties of that alloy				
	Strength	Formability	Weldability	Corrosion resistance	Machinability
1XXX	Low	Excellent	Yes	Yes	Good
2XXX	High	Poor	Yes	Yes	Excellent
3XXX	Moderate	Formable	Yes	Yes	Good
5XXX	Good	Formable	Yes	Excellent corrosion resistance	Good
6XXX	Good	Excellent	Yes	Yes	Good

The temper – or hardness – of each alloy creates differences in the characteristics of the material and how it will respond when punched, formed or welded. For example, it is possible to optimise specific mechanical properties of heat treatable alloys (such as 2xxx and 6xxx series) through heat treatment. That is why temper designations are used to communicate how the alloy has been mechanically or thermally treated.



Alloy temper designations¹

The first character in the temper designation (a capital letter, F, O, H, W, or T) indicates the general class of treatment.

- **F, as fabricated.** Most F-temper products are “semi-finished” products. They will be used in shaping, finishing or thermal processes to achieve other finished forms or tempers.
- **O, annealed.** Annealing treatments are used to achieve the lowest-strength condition for the alloy. The main reason is to maximize workability or increase toughness and ductility.
- **H, strain-hardened.** This is for non-heat-treatable alloys that have had their strength increased by strain hardening, usually at room temperature.
- **W, solution heat-treated.** This designation applies only to alloys that age naturally and spontaneously after solution heat treating. It is rarely a finished temper.
- **T, thermally treated.** This applies to any product form of any heat-treatable alloy that has been given a solution heat treatment followed by quenching and aging.

Common alloy temper designations for caps, closures and component for medical and cosmetic applications include: H14 which is half hard and H16, which is $\frac{3}{4}$ hard.

Colour flair with Alanod

Alanod offers a wide variety of UV stable colours that can mirror or match natural metal looks, including stainless steel, brass, gold, zinc, pewter, bronze, copper, and muntz. Some of these metal looks are also available in pre-patina or antique versions.

Also available are two different variants of lacquer to refine metal coils: one is more rigid for more flat geometry with minimal bends to it, the other is a more flexible lacquer which is highly formable.

Both types can be:

- Coloured to suit
- Anti-scratch
- Anti-fingerprint
- UV-resistant
- Printable
- Translucent

The ability to create custom colours, as well as match almost any colour that can be imagined, is particularly important for cosmetics brands.



Look and feel are important

When choosing which aluminium to use for a cap, closure or component, the desired look and feel of the end product are key. If finish consistency is important, then 1000 series alloys are not recommended, as although highly formable and cost-effective, they don't always anodise evenly. For consistency, 5000 series alloys have less impurities and offer more colour consistency across batches. They are also stronger and can withstand more drawing and pressing.

Colours

Pre-anodised coloured alloys with a gloss or matt finish are best used for shallower caps, closures or components, as deep draws can have crazing on the curve. If the draw is deeper, then anodising is recommended once the item has been drawn.

When it comes to colour choice however, in addition to standard anodised metal colours, lacquers can give product designers increased colour flexibility.

Finishes

Are longevity or good looks key to the cap, closure, or component's design, or is resistance to sterilisation more important? Whatever the desired goal, it is important that the right alloy is chosen, at the appropriate hardness to deliver the required finish:

For example:

- If a gloss finish is wanted, the aluminium alloy 5657 gives the best brightening properties and consistency but costs more than 1xxx series alloys, so a balancing act is needed between consistency, cost, and finish.
- For components where high levels of reflection are important, such as in cosmetic hair removal products, will the alloy tolerate being coated with a PVD silver to get the reflection?
- If longevity is key, does the alloy and finish pass a 500-hour salt spray test?

Turning design specifications into reality requires materials knowledge on the part of the designer, aluminium provider and fabricator. However, thanks to the versatility of aluminium, the range of alloys available and the colours and finishes that are now on hand for designers, means that there is a solution to suit even the most unusual pharmaceutical or cosmetic cap, closure, or component requirements.



¹ <http://www.shapesbyhydro.com/>

CREATE THE DIFFERENCE

Durability, functionality and looks are all important when it comes to medical and cosmetic caps, closures and components.

With its wide range of alloys and finishes, Alanod provides producers with highly versatile ways to keep one step ahead when it comes to meeting demand.

For more information or for technical advice, please visit www.alanod.co.uk



Alanod Ltd
Chippenham Drive
Milton Keynes
MK10 0AN
UK

T: +44 (0)1908 285 507
E: TranterS@alanod.co.uk
W: alanod.co.uk

