

Silica Sol Casting

[Silica sol casting](#) is a form of investment casting. The process is very similar, except that the investment is made from silica sol zircon sand mixed with refractory powder. The silica sol zircon grit is very fine (10-20 microns) and can be mixed into a very low viscosity slurry when making molds. The result is a casting method that provides dimensionally accurate castings and an excellent as-cast surface finish. Crucially, silica sol zircon molds can withstand temperatures up to 2000° C, making them useful when casting superalloyed and stainless steels.

Advantages of silica sol investment casting:

Versatile; suitable for casting most metals.

Will allow the production of very complex castings with thin walls.

A smooth surface finish can be achieved without parting lines, so machining and finishing can be reduced or eliminated.

Allows precision casting of unmachinable parts.

Excellent dimensional accuracy

Silica Sol Process

Make a metal mold with the same impressions that will be required for the final mold.

Molten wax is injected into a metal mold to form a pattern, allowed to solidify and then removed.

Some intricate wax patterns are made by using adhesive to join several individual patterns together.

The wax is then assembled on the wax tree, many parts can be placed on the tree depending on the size, the weight of the assembly is usually between 0.1 kg and 50 kg.

The tree is then dipped into a silica sol zircon slurry to coat the wax, which is very fine and low viscosity, resulting in an excellent as-cast surface finish. The slurry is coated with a refractory material, and the process is repeated several times until a shell forms around the wax mold.

The drying process is crucial. The shell must be allowed to dry naturally at a constant temperature to bond the silica sol gel and refractory particles, resulting in a strong, high-quality shell mold. Place the wax tree in an oven at about 200 degrees to melt the wax.

After all the wax is removed, the trees are heated to over 1000 degrees in preparation for casting.

The metal is then poured into a hot mold, allowing the alloy to reach the thinnest part of the mold before solidifying.

Process limitations:

There are some disadvantages to this process, including:

The preparation of wax and shell molds is time-consuming and can be expensive due to the need to naturally dry the mold under temperature-controlled conditions.

Investment casting is less suitable for very high volume manufacturing due to cycle times.