Extrusion Dies

Longer Tool Life with Better Dimensional Control ... Less Down Time & Improved Surface Finish

Actual size

Conventional Applications – Improved Results

Zirconia ceramic extrusion dies, from Zircoa, are frequently used with a direct press, in which the billet moves through the die. Our dies are equally successful in an indirect press, in which the die moves through the billet. When properly used, Zircoa ceramic extrusion dies will significantly reduce machine shop rework, and consistently out-perform traditional tool steel and stellite dies, as well as high strength nickel alloy dies of INCONEL®718.

The effectiveness of Zircoa ceramic dies can be partially attributed to the unique properties of zirconia. These material properties include: high temperature stability, chemical inertness, hardness, wear resistance and corrosion resistance. Zircoa's 40+ years of manufacturing expertise, and its partnering with the extrusion manufacturer insure a consistently long die life.

Optimizing Ceramic Die Performance

Our partnering with extruders has shown there are four basic steps to a successful switch from metal dies to ceramics. They include:

Design – The ceramic die should be as close to the metal configuration as possible, with a moderate wall thickness, such as 12.5 mm for a tube die. The land length should be just long enough to form the desired shell or rod diameter.

Shrink Fit – A refractory tool steel, such as H13, is commonly used for the case. Zircoa sales engineers can recommend the amount of interference and provide guidance on how to shrink fit. We also offer the ceramic die and case assembly.

Processing Adjustments (*Preheat)* — Die and case can go directly into preheat following shrink fit, and should be allowed to preheat for one hour per 25.4mm (1.0") of assembly wall thickness. *(Cycling)* – With ceramic dies, fast press cycles are preferred. The objective is to prevent the ceramic from cooling down, without overheating the case.

Training – Understanding the difference between metal and ceramic dies is key to successful application of ceramic dies. To aid in this understanding, Zircoa provides training and trouble-shooting during start-up.

We are happy to discuss the complete details on switching from metal to ceramic dies. Please contact our application engineers for more information.

Products Suited to Your Special Needs

Zirconia extrusion dies can be manufactured in various shapes in addition to the standard round die. Current Zircoa customers also use hexagonal, square, rectangular and oval die shapes. Dies made by Zircoa are used to extrude non-ferrous alloys such as Copper, Copper-Nickel, Brass, and other Copper Alloys, in sizes from 2.54mm (0.10") ID to 152.4mm (6.0") OD.

Zircoa offers two compositions of zirconia. Each is blended to satisfy the specific requirements of the extrusion manufacturer.

2016 – Tube Extrusion, for OD's up to 152.4mm (6.0") This composition is well-suited for tube dies. It is specifically formulated to enhance its resistance to thermal shock and improve its ability to stand-up to thermal cycling.

5027 – Rod and Shape Extrusion, for diameters up to 50.8mm (2.0") Dies made of this composition have the extra strength and toughness needed for high reduction ratio extrusions.

Properties

	2016	5027
Composition, wt %	97.0 ZrO_2 3.0 MgO	97.0 ZrO_2 3.0 MgO
Bulk density, g/cm³	5.5	5.6
Apparent porosity, %	0	0
MOR at room temp, 10^3 psi	30	60
MPa	207	414
CTE x10^{-6} L/L/°C		
600°C	7	5
1000°C	7	5
1300°C	3	7
Thermal conductivity, W/m K @ 260°C	2	2

Ready to Assist You

Need more help, or have a specialized need? We are ready to put our 40+ years of experience to work for you. Please contact our application engineers to discuss your requirements.

Zircoa®

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