

# Industrial Ceramic Technology, Inc.

37 Enterprise Drive Ann Arbor MI 48103  
Telephone (734)761-8137 Fax (734)996-0808  
www.lndceramicttech.com

## **FLEXIBLE CERAMIC BEARINGS \*Patent Pending**

### **Problem**

Ceramic bearings are of interest for many applications requiring high wear resistance under conditions of high stress, impact loading and environmental effects such as dirt and dust. Ceramic bearings can be produced in numerous ceramic systems via sintering, injection molding or other press-and- sinter- means, but achieving high strength, toughness and wear resistance is not possible unless optimum mechanical properties are produced. Maximum mechanical properties can be easily produced by hot-pressing methods but shapes such as cylinders for bearings are costly and not easily produced in large quantities.

Another limitation with ceramic bearings is the assembly of the bearing on a shaft or in the bore of a housing. Machining of the shaft, housing bore, and ceramic bearing to very exact tolerances is mandatory in order to assemble the bearing with minimum force fitting. Ceramics cannot be press-fit into a bore like other materials due to the high tensile stresses at the circumferential contact line produced by this method of assembly. Also, achieving an interference fit may not be possible by heating the housing to increase the bore dimensions. Such methods also add considerable cost to the ceramic bearing assembly.

### **Approach**

A material has been developed by ICT, Inc., which offers a unique solution to this problem. High mechanical properties are produced by hot pressing methods in shapes such as solid, right cylinders. The patented (U.S Pat. No. 5,177,037) material, CRYSTALOY, is electrically conductive allowing for electrical discharge machining(EDM) at tool steel speeds. Thin wall bearings, less than 0.100 inch, have been produced and demonstrate the ease of assembly. The key factor is the bearing design which incorporates a .010 inch EDM'd , or laser cut slot through the wall either, axially along the bearing length, or in a spiral configuration. This allows for expansion and contraction of about .003 - .006 inch which is sufficient for assembly by hand pressure over the shaft or in a bore. While straight slots are sufficient for most applications, additional angles or spiral configurations may be used. The CRYSTALOY ceramic composites wear resistance is greatly increased with the addition of ceramic whiskers which also allows for

laser slicing due to increased toughness and thermal shock resistance. Laser slicing up to .375 inch thickness is very cost-effective.

### **Payoff**

Assembly by simple hand pressure makes possible numerous applications for hard, wear resistant ceramic bearings. Costly machining to produce tight tolerances is negated since the ceramic bearing will readily conform to the contact surface.

Physically squeezing or twisting the ceramic bearing will sufficiently reduce or increase the bearing diameter allowing for ease of assembly.

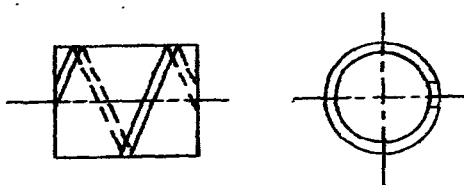
The CRYSTALOY ceramic composite allows for untended EDM procedures to be used to cut solid right-cylinders into many thin wall configurations in one set-up which lowers the fabrication cost.

The slotted design provides means of lubricating the bearing in the same manner as grooved, babbitt bearings.

Such hard, wear resistant bearings may provide solutions to current limitations in military vehicles, aerospace, automotive, and industrial applications as well as consumer products.



Axial Slot



Spiral Slot

ICT, Inc.