

CCE COORDINATION BULLETIN 2005-1, REV. 1

EVALUATION OF CERAMIC MATERIAL ON EQUIPMENT WITH A 3-A SYMBOL

Purpose: This guideline applies to the use of ceramic materials in equipment covered by a 3-A Symbol.

Application: The following guidance shall be used by the CCE when performing TPV evaluations of equipment that utilizes ceramic materials. This guidance is effective immediately upon receipt, shall supersede any other 3-A information on the use of ceramic materials for hygienically-designed dairy equipment and shall remain in effect until revoked or included in an update of the *TPV Manual* and/or *3-A Format & Style Manual* or specific 3-A Standard(s).

ACCEPTABLE CERAMIC MATERIALS

Some 3-A Sanitary Standards have the wording “ceramic materials may be used” and some have the wording “ceramic materials, including tungsten carbide may be used.” We are providing this guidance to assist the CCEs in making a determination as to the acceptability of specific types of ceramic materials.

Ceramics encompass such a vast array of materials that a concise definition is almost impossible. However, one workable definition of ceramics is that they are refractory, inorganic, and nonmetallic materials.

The reference to “nonmetallic” does not mean metal components are prohibited in the ceramic. Rather, it refers to the chemist’s definition of metallic vs. nonmetallic: Metal may include any of several chemical elements that are usually shiny solids that conduct heat or electricity and can be formed into sheets.

Ceramics can be divided into two classes: traditional and advanced. Traditional ceramics include clay products, silicate glass and cement; while advanced ceramics consist of carbides (SiC), pure oxides (Al₂O₃), nitrides (Si₃N₄), non-silicate glasses and many others.

In order to determine the suitability of a ceramic material, it must conform to the properties described in the applicable 3-A Sanitary Standard Materials Section, Section C. Below is the appropriate section from the current *3-A Format & Style Manual*.

“Where materials are required for specific applications **{all required application(s)}**, carbon, or ceramic materials, including tungsten carbide, may be used. Carbon and ceramic materials shall be inert, nonporous, nontoxic, nonabsorbent, insoluble, and resistant to scratching, scoring, and distortion when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment **(or sterilization)**.”

The majority of these criteria can only be determined after a period of use and there are no test procedures specified in the 3-A criteria that can be used to validate the materials.

It is important to consider the performance criteria as described. Many ceramic materials are specified with conformity to ASTM C373 testing to indicate little or no water absorption. Further, ceramic materials should be free of leachable lead, cadmium, and other potentially toxic heavy metals.

However, there are two references available that list the most common technical ceramic materials and industrially important ceramics.

<http://www.keramverband.de/keramik/englisch/fachinfo/werkstoffe/werkstoffuebersicht.htm>

<http://www.ferroc ceramic.com> - Side Menu – Ceramic Properties

As a further resource, the following list of ceramic materials is offered as examples for those commonly applied as seal faces in mechanical seals:

- silicon carbide
- tungsten carbide
- chrome oxide
- alumina
- zirconia
- graphite (carbon)

CCEs will find these lists useful to help identify a specific type of ceramic material. Other ceramic compounds not listed in these sources are also acceptable with proper documentation, i.e., the compound is a ceramic material, it is demonstrably nontoxic, and the material meets all other requirements of the applicable Standard.