

Electrically conductive ceramics and their use in fiber charging apparatus

Description of Technology: This invention provides a ceramic composition of magnesia, chromia and alumina, that when sintered forms a polycrystalline, solid solution alumina-based body that is electrically conductive at room temperature, has excellent electrical stability, and excellent mechanical properties. More specifically, by controlling the chromium, magnesium and impurity levels and by avoiding undesirable segregation and second phase formations at grain boundaries, superior room temperature semiconducting properties are achieved in an alumina-based polycrystalline ceramic.

Patent Listing:

1. **US Patent No.** 5,601,853, Issued on February 11, 1997, “Electrically conductive ceramics and their use in fiber charging apparatus.”

<http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahhtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=5,601,853.PN.&OS=PN/5,601,853&RS=PN/5,601,853>

2. **US Patent No.** 5,656,203, Issued on August 12, 1997, “Electrically conductive ceramics with oxides of Al, Cr, and Mg.”

<http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahhtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=5,656,203.PN.&OS=PN/5,656,203&RS=PN/5,656,203>

Market Potential: The use of a ceramic material having suitable resistivity for the passive charge collecting electrode in accordance with this invention improves the operability, stability and the longevity of the charging plate. A typical plate thickness is about 3/8 inch (0.95 cm). Preferably, the ceramic used for such plates has a volume resistivity of from about 1.times.10.sup.9 to about 5.times.10.sup.9 ohm-cm measured at the operating temperature. For example, at 15 kV the ceramic used for a 0.95 cm thick plate suitably has a volume resistivity of about 1.6.times.10.sup.9 ohm-cm. For thinner plates (e.g., down to about 0.18 cm) somewhat higher volume resistivity (e.g., 5.times.10.sup.9 to 1.times.10.sup.10 ohm-cm) are generally more desirable. Thicker plates would use lower resistivities. It is also desirable that the ceramic have a Vickers hardness of at least about 5 GPa (preferably at least about 14 GPa) and a modulus of rupture (i.e., breaking strength) of at least about 400 MPa. Conductive ceramic compositions of oxides of Mg.sup.+2, Cr.sup.+3 and Al.sup.+3 of this invention are considered suitable for this application.

Benefits:

- Improved operability, stability, and the longevity of the charging plate.
- Vicker hardness of at least 5GPa’s
- Electrically conductive at room temperature.
- Excellent electrical stability.
- Excellent mechanical properties.

Applications:

- Electrostatic fiber charging applications.

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