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<?xml version="1.0" encoding="UTF-8"?>
<!--
    ********************************************************************************************************************
    MatML Version 3.0 Schema Example 1 - Structural Ceramic from an Online Materials Database
    Prepared by - E.F. Begley, NIST
    Source - NIST WebSCD, http://www.ceramics.nist.gov/srd/scd/Z00363.htm, R.G. Munro and E.F. Begley,
    January 2002
    ********************************************************************************************************************
-->
<MatML_Doc xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance" xsi:noNamespaceSchemaLocation="matml.xsd">
    <Material>
        <BulkDetails>
            <Name>silicon nitride</Name>
            <Class>ceramic</Class>
            <Subclass>nitride</Subclass>
            <Specification>NCX-5102</Specification>
            <Source>Saint-Gobain/Norton Industrial Ceramics</Source>
            <Form>bar</Form>
            <ProcessingDetails>
                <Name>hot isostatic pressing</Name>
                <Notes>
                    "The material produced is designated NCX-5102 and consists of a silicon nitride-4% yttria composition
                    that is densified by glass-encapsulation HIPing. ... Large-scale batches (30 kg) of Si3N4-4% Y2O3
                    powder were milled in water, and the slurry was used to cast hundreds of tensile rods. The starting Si3N4
                    powder (Ube) was derived from a dimmide process. ... The net-shape-formed bars were HIPed using
                    glass encapsulation (ASEA Cerma AB, Robertsford, Sweden). The HIP process was optimized using
                    pressure, time and temperatures to assure full densification and development of an elongated
                    microstructure for desired fracture toughness..."
                </Notes>
            </ProcessingDetails>
            <Characterization>
                <Formula>Si3N4·4wt%Y2O3</Formula>
                <ChemicalComposition>
                    <Compound>
                        <Element>
                            <Symbol subscript="3">Si</Symbol>
                        </Element>
                        <Element>
                            <Symbol subscript="4">N</Symbol>
                        </Element>
                    </Compound>
                    <Compound>
                        <Element>
                            <Symbol subscript="2">Y</Symbol>
                        </Element>
                        <Element>
                            <Symbol subscript="3">O</Symbol>
                        </Element>
                        <Concentration>
                            <Value format="integer">4</Value>
                            <Units description="mass fraction">
                                <Unit>%</Unit>
                            </Units>
                        </Concentration>
                    </Compound>
                </ChemicalComposition>
            </Characterization>
            <PropertyData property="pr1" technique="mt1" source="ds1">
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                <ParameterValue parameter="pa1" format="integer">23,1370</ParameterValue>
            </PropertyData>
            <PropertyData property="pr2" technique="mt1" source="ds1">
                <Data format="integer">997,396</Data>
                <ParameterValue parameter="pa1" format="integer">23,1370</ParameterValue>
                <ParameterValue parameter="pa2" format="string">540-1237,344-452</ParameterValue>
            </PropertyData>
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    <PropertyData property="pr3" technique="mt1" source="ds1">
        <Data format="string">4,-,-</Data>
        <ParameterValue parameter="pa5" format="string">Tensile,Flexural,Flexural</ParameterValue>
        <ParameterValue parameter="pa1" format="integer">23,23,1370</ParameterValue>
        <ParameterValue parameter="pa4" format="integer">665,653,517</ParameterValue>
        <ParameterValue parameter="pa6" format="integer">1109,-,-</ParameterValue>
    </PropertyData>
    <PropertyData property="pr4" technique="mt1" source="ds1">
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        <ParameterValue parameter="pa1" format="integer">23</ParameterValue>
        <ParameterValue parameter="pa3" format="integer">4</ParameterValue>
        <ParameterValue parameter="pa4" format="integer">665</ParameterValue>
    </PropertyData>
</BulkDetails>
<Metadata>
    <DataSourceDetails id="ds1" type="journal article">
        <Name>
            "Reliable Ceramics for Advanced Heat Engines," V.K. Pujari, D.M. Tracey, M.F. Foley, N.I. Paille, P.J. Pelletier,
            L.C. Sales, C.A. Willkens, and R.L. Yeckley, American Ceramic Society Bulletin, Vol. 74[4], pp. 86-90
            (1995), published by American Ceramic Society
        </Name>
        <Notes>
            Cautions
            1. Data evaluated by acceptance criteria
            2. "The nonlinear character of the distribution with multiple inflections suggests that a two-parameter Weibull
            fit of these data (sigma = 1038 MPa, m = 10.4) is inappropriate and that the multimodal nature of the data
            should be represented using competing risk analysis. ... The important feature of the three-parameter Weibull
            distribution is the existence of a threshold  stress below which there is zero probability of failure."
        </Notes>
    </DataSourceDetails>
    <PropertyDetails id="pr1" type="mechanical">
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        </Units>
    </PropertyDetails>
    <PropertyDetails id="pr2" type="mechanical">
        <Name>Tensile Strength</Name>
        <Units name="MPa" description="megapascals">
            <Unit>MPa</Unit>
        </Units>
    </PropertyDetails>
    <PropertyDetails id="pr3" type="mechanical">
        <Name>Weibull Modulus</Name>
        <Unitless/>
    </PropertyDetails>
    <PropertyDetails id="pr4" type="mechanical">
        <Name>Weibull Strength</Name>
        <Units name="MPa" description="megapascals">
            <Unit>MPa</Unit>
        </Units>
    </PropertyDetails>
    <MeasurementTechniqueDetails id="mt1">
        <Name>Literature survey</Name>
        <Notes>
            The authors cite V.R. Pujari et al., "Development of Improved Processing and Evaluation Methods for High
            Reliability Structural Ceramics for Advanced Heat Engine Applications, Phase I," final report, ORNL/Sub/89-SB182/1,
            NTIS Rept. No. DE93-040528, August (1993), and summarize the procedure as follows. "The cylindrical buttonhead
            specimens were machined to ORNL design with a gauge diameter of 6.0±0.1 mm. ...50 mm diameter, 150 mm long
            specimens... were machined as many flexure bars (3 mm by 4 mm by 50 mm) for assessment of the properties
            across the 50-mm section."
        </Notes>
    </MeasurementTechniqueDetails>
    <ParameterDetails id="pa1">
        <Name>Test Temperature</Name>
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                <Units name="degree Celsius">
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                </Units>
            </ParameterDetails>
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            </ParameterDetails>
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            </ParameterDetails>
            <ParameterDetails id="pa6">
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</MatML_Doc>
```