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<?xml version="1.0" encoding="UTF-8"?>
<!--
    ********************************************************************************************************************
    MatML Version 3.0 Schema Example 3 - Steel with TiC Coating from a Journal Article
    Prepared by - E.F. Begley, NIST
    Source - A. Agarwal and N.B. Dahotre, “Pulsed Electrode Surfacing of Steel With TiC Coating -
    Microstructure and Wear Properties,” ASM Journal of Materials Engineering and Performance, Vol. 8,
    No. 4, pp. 479-486, 1999.
    ********************************************************************************************************************
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<MatML_Doc xmlns:xsi="http://www.w3.org/2000/10/XMLSchema-instance" xsi:noNamespaceSchemaLocation="matml.xsd">
    <Material>
        <BulkDetails>
            <Name>TiC coated AISI 1018 steel</Name>
            <Class>composite</Class>
            <Subclass>ceramic coating on metal substrate</Subclass>
            <Form>coupon</Form>
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            <Name>steel</Name>
            <Class>metal</Class>
            <Specification authority="American Iron and Steel Institute">AISI 1018</Specification>
            <Form>coupon</Form>
            <ProcessingDetails>
                <Name>Mechanical Polishing</Name>
                <Notes>The coupons were mechanically polished on emery paper of grit size 240.</Notes>
            </ProcessingDetails>
            <ProcessingDetails>
                <Name>Rinsing</Name>
                <Notes>After polishing, the coupons were rinsed in acetone.</Notes>
            </ProcessingDetails>
            <ProcessingDetails>
                <Name>Coating</Name>
                <Notes>
                "A sintered electrode of TiC was used to deposit a coating on these steel coupons. The TiC electrode
                had 3 to 5 wt% Ni and 1 to 3 wt% Fe as binder. Deposition was carried out using a handheld gun in air
                at room temperature. Pulsed electrode deposition was carried out at a voltage of 50V and spark time of
                10µs. The discharge capacitance used for the PES process was 450µF with a current of 25A."
                </Notes>
            </ProcessingDetails>
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                <Shape>square</Shape>
                <Dimensions>25mm x 25mm</Dimensions>
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        </Uncertainty>
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    <Name>titanium carbide coating</Name>
    <Class>carbide</Class>
    <Subclass>monocarbide</Subclass>
    <Characterization>
        <Formula>TiC·xFe</Formula>
        <PhaseComposition>
            <Name>TiC</Name>
        </PhaseComposition>
        <PhaseComposition>
            <Name>Ti</Name>
            <Concentration>
                <Value format="string">5,25</Value>
                <Units description="mass fraction">
                    <Unit>%</Unit>
                </Units>
                <Qualifier>min.,max.</Qualifier>
            </Concentration>
        </PhaseComposition>
        <PhaseComposition>
            <Name>Fe-C (austenite)</Name>
        </PhaseComposition>
        <PhaseComposition>
            <Name>Fe (ferrite)</Name>
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            <Name>FeTi</Name>
            <Notes>Possible</Notes>
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        <Associate>AISI 1018 steel</Associate>
        <Relationship>coating</Relationship>
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    <Name>heat affected zone (HAZ)</Name>
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    </PropertyData>
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</ComponentDetails>
<Metadata>
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        <Name>
            A. Agarwal and N.B. Dahotre, "Pulse Electrode Surfacing of Steel with TiC Coating: Microstructure and Wear Properties," ASM Journal of Materials Engineering and Performance, Vol. 8, No. 4, pp. 479-486, 1999
        </Name>
        <Notes>
            Data were digitized from Fig. 9. The reported unit, "gm", is interpreted to mean "g", grams.
        </Notes>
    </DataSourceDetails>
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        <Units name="g" description="gram">
            <Unit>g</Unit>
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    </PropertyDetails>
    <PropertyDetails id="pr2" type="mechanical">
        <Name>Coefficient of Friction</Name>
        <Unitless/>
    </PropertyDetails>
    <PropertyDetails id="pr3" type="mechanical">
        <Name>Microhardness</Name>
        <Units name="kg/mm^2" description="kilograms per square millimeter">
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            <Unit power="-2">mm</Unit>
        </Units>
    </PropertyDetails>
    <MeasurementTechniqueDetails id="mt1">
        <Name>Block-on-Disk Tribometer</Name>
        <Notes>
            "Coated coupons of dimension 25 x 25mm were tested for dry sliding wear against a hardened steel ring rotating at a linear speed of 270m/min. Weight loss measurements were made after successive 2 min. The dry sliding wear test was conducted for 10 min with an applied normal load of 2 kg."
        </Notes>
    </MeasurementTechniqueDetails>
    <MeasurementTechniqueDetails id="mt2">
        <Name>Block-on-Disk Tribometer</Name>
        <Notes>
            "The coefficient of friction (μ) was also recorded simultaneously by an interface computer, which acquired data in the form of electrical output power of the motor. Even though data were recorded at a frequency of 1 Hz for a total test time of 10 min, an average of 10 successive points was taken for computing the coefficient of friction, μ. ...the coefficient of friction is calculated by measuring the changes in voltage and current in the electrical circuit of the motor driving the block-on-ring tribometer during loading..."
        </Notes>
    </MeasurementTechniqueDetails>
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        <Name>Block-on-Disk Tribometer</Name>
    </MeasurementTechniqueDetails>
    <MeasurementTechniqueDetails id="mt4">
        <Name>Knoop Indentation</Name>
        <Notes>
            "Microhardness measurements were performed on a Buehler Micromet II microhardness tester using a Knoop indenter with normal load of 200 g applied for 15 s."
        </Notes>
    </MeasurementTechniqueDetails>
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        <Units name="min" description="minutes">
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    </ParameterDetails>
    <ParameterDetails id="pa2">
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                    <Unit power="-1">min</Unit>
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            </ParameterDetails>
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                    <Unit>kg</Unit>
                </Units>
            </ParameterDetails>
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</MatML_Doc>
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