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### **Structural, morphological and electrical properties of sintered Fe<sub>2</sub>O<sub>3</sub>/TiO<sub>2</sub> nanopowder mixtures**

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Starting nanopowders of TiO<sub>2</sub> (anatase 99.7%) and α-Fe<sub>2</sub>O<sub>3</sub> (hematite) were mixed in the weight ratio 60:40 and 40:60. Green samples were sintered in the temperature range 750-1250°C in air. Structural, morphological and electrical studies were carried out using XRD, SEM and EDS analysis and Hall measurements with the aim of analyzing the influence of the starting nanopowder structure on the resulting sample composition, density, grain size and electrical resistivity. Compared to pure anatase samples, the presence of hematite lowered the temperature of completion of the anatase to rutile phase transformation to 850°C. Formation of pseudobrookite was also noted at this temperature. Further increase in the sintering temperature lead to increase in sample density and grain size and decrease in the electric resistivity, Hall coefficient and mobility.

X/4

### **Comparison of mechanical behaviour of SiC sintered specimen to analysis of surface defects**

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This research examined SiC sintered specimens with high hardness and strength. This material is used to protect of projectile impact for military purposes. The testing procedure consists of structure examination obtained using XRD analysis, surface examination by SEM analysis and optical microscopy, examination of mechanical properties and density determination. Analysis confirmed surface irregularities characterized using image analysis. The sample is subjected to bending. Finite element modeling was used to simulate the behavior of sample subjected to bending in presence of critical damage on surface. It is confirmed that there is correlation between the largest irregularities determined on surface and measured strength of sample. Simulations show the significance of damage size. The size of damage on surface is considered to be the critical parameter for quality determination.