NANO HIGHLIGHT
Nanostructured Functionally Graded Metalloceramic Biomaterials

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With the advancement of modern materials science, it is often found that a single material, if homogeneous in structure and composition throughout its thickness, does not possess all of the desired properties for certain applications. For the specific case of wear resistant coatings on metallic orthopedic implants, we are proposing techniques to produce functionally graded transitions in composition and nanostructure that will create unique materials simultaneously providing improved wear resistance, bioactivity, and coating/implant interfacial adhesion when compared to conventional biomaterials. These multi-functional coatings do not contain sharp interfacial boundaries, but instead provide a gradual extension of the implant from metallic bonding near the implant/coating interface to primarily covalent bonding near the surface. These aptly named *Nanostructured Functionally Graded Metalloceramic (NFGM)* coatings will represent the next generation of wear-resistant coatings, especially for orthopedic implants which benefit from having a metallic core (e.g. titanium for matching of bone modulus) along with ultra-hard and smooth, ceramic articulating surfaces.

Figure 1 shows Transmission Electron Microscopy (TEM) images of functionally graded nanostructured metalloceramic coating for biomedical applications[1].

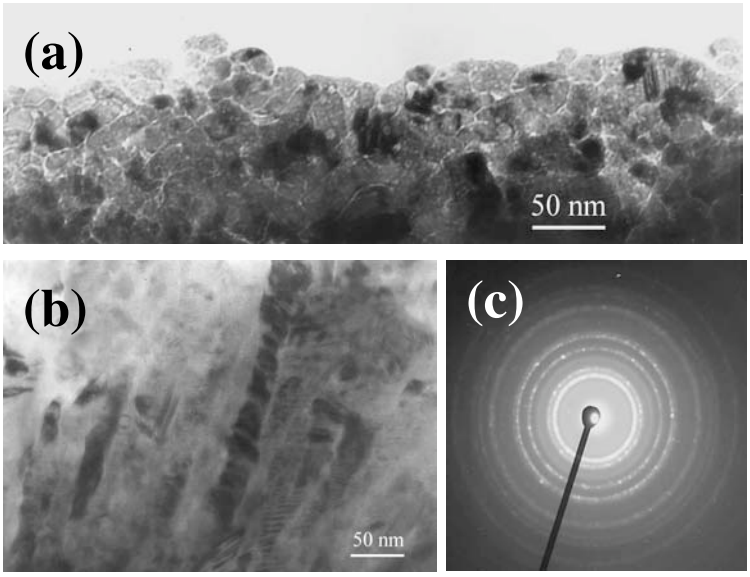

FIGURE 1. Cross-sectional TEM images from nanostructured metalloceramic Ti-Cr-N coating. (a) the topmost surface of the film and (b) below the surface of the film. Both areas show a selected area diffraction pattern (c) indexed to FCC structure.

References (10 point font)

[1] S. A. Catledge, Yogesh K. Vohra, S. Woodard, and R. Venugopalan, "Structural and Mechanical Properties of Nanostructured Metalloceramic Coatings on Cobalt Chrome Alloys", Appl. Phys. Lett. **82**, 1625 (2003).