

# 20<sup>TH</sup> ASIA-PACIFIC NANOTECHNOLOGY CONGRESS

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### Recent developments in electrodeposited nanocomposite materials

Nanocomposites made by electrodeposition consist of a nanocrystalline (grain size <100 nm) metal matrix with co-deposited second phase particles (e.g. ceramics, polymers) in the nanometer to micrometer size range to modify various properties. The nanocrystalline metal matrix gives the composite excellent mechanical properties (e.g. hardness, strength, wear resistance) while the second phase particles in different concentrations can be used to tailor specific functional properties. The discussion will be on several nanocomposites for specific industrial applications. The first type of composites deals with superhydrophobic and hydrophobic materials used for anti-wetting and anti-corrosion surfaces. Two examples will be described in detail: Nickel-Teflon and nickel-cerium oxide nanocomposites. The second group of composites is for applications in thermal management (e.g. heat sinks) of electronic devices. Examples include nickel-diamond and copper-diamond composites. The main purpose of the diamond particles in these materials is to increase their thermal conductivity. The third type of composites is for metallic surfaces with different colors. Pigment particles are deposited with a nickel matrix to produce a wide variety of colors on an otherwise silvery metallic nickel surface. The technological and economic feasibility to produce such types of composites for large scale industrial applications both for surface coatings or as bulk deposits will be discussed.

### Biography

Uwe Erb has received his PhD in Materials Science from the University of the Saarland, Germany. He is currently working as a Professor in Materials Science and Engineering at the University of Toronto. He is named as Inventor on 18 patents related to the synthesis of nanostructured materials by electrochemical methods and has authored about 250 scientific publications in the field of bulk nanomaterials. He along with his research team were the first to synthesize fully dense nanostructured metals in 1985 and developed numerous industrial applications for these materials with various companies. His latest research has been broadened to include bio-inspired nanostructures.

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