Designing a Water Repellent and Breathable Material for Wound Dressings Using Nanotechnology

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Available wound dressing materials in the market are not optimal because they trap moisture and do not prevent penetration of water. The excess moisture promotes bacterial growth leading to infection. These clear pitfalls inspired the creation of a material that is hydrophobic, breathable, and biocompatible using nanotechnology. First, Gold film is deposited on polystyrene sheets (PS) using a Sputter Coater. The sample is heated to 160 degrees Celsius. The exposure to high temperature causes the PS sheet to shrink. Because gold cannot shrink, it wrinkles to fit the size of a PS. These wrinkles increase the surface roughness of the material. The wrinkles are transferred onto PDMS and examined for contact angle and surface roughness. The effects of different thicknesses of gold (5 nm, 10 nm, 15 nm) on the surface roughness and contact angle are examined. This study demonstrates that an increase in thickness of gold leads to an increase in surface roughness of the material exponentially and increase in the contact angle of the material linearly. Next, 25 perforations are added to the material, and breathability is tested using the upright cup method. The final material has a contact angle with water of 135 degrees (very hydrophobic) and is 230% more breathable than TegaDerm, the leading water repellent and breathable wound dressing brand.

Awards Won:
Drug, Chemical &amp
Associated Technologies Association (DCAT): First Award of $3,000.