

# Design and Characterization of Microwave Absorbing Fabrics for Advanced Stealth and EMI Shielding Applications

Garima Mehra<sup>1</sup>, Niti Anand<sup>1</sup>, Pallavi Mahajan<sup>1</sup>, Pooja Kansra<sup>1</sup>, Sachin Kumar<sup>1</sup>, Varinder Kaur<sup>1</sup>, Mandeep Singh<sup>2</sup>, Ashwani Kumar Sood<sup>3</sup>, Anupinder Singh<sup>4</sup> and Parambir Singh Malhi<sup>1,a</sup>

<sup>1</sup>Department of Apparel and Textile Technology, Guru Nanak Dev University, Amritsar 143005, Punjab, India

<sup>2</sup>Department of Physics, Guru Nanak Dev University, Amritsar, Punjab-143005, India

<sup>3</sup>Department of Chemistry, Guru Nanak Dev University, Amritsar, Punjab-143005, India

<sup>4</sup>Multifunctional Materials Laboratory, Department of Physics, Faculty of Sciences, Guru Nanak Dev University, Amritsar 143005, Punjab, India

<sup>a</sup> Corresponding author: [parambirmalhi@gmail.com](mailto:parambirmalhi@gmail.com)

**Abstract:** We are living in a technologically advanced world and our dependence on wireless technologies and IoT are also increasing day-by-day. Owing to the extensive use of wireless techniques, the human body has so far been exposed to heavy electromagnetic (EM) / microwave radiation, raising growing concerns over health hazards, information leakage and signal interference in the recent years. However, the existing EM shields available in the market are extremely bulky, metallic and not wearable. This study investigates the making of stealth fabrics in which our textile substrate has been dip/spray coated with microwave absorbing ferrite materials for developing lightweight and flexible fabrics. The stealth fabric has multiple applications across Military, Medical textiles, IoT, Aerospace, Automobile textiles and tactile wear. It represents the design, fabrication, and performance evaluation of textile-based composites engineered for effective microwave absorption in the X-band (8–12 GHz) and Ku-band (12–18 GHz) frequency ranges. The dielectric and magnetic properties of the fabrics were analyzed using Vector Network Analysis (VNA). It has been verified that the prepared fabric was able to achieve reasonable absorption. This work contributes to the advancement of multifunctional textiles for next-generation stealth and protective systems.

**Keywords:** Microwave absorbing fabrics, stealth fabrics, EMI Shield, Coating, Technical textiles

## Ferrite-Based Materials – Our Secret Weapon

