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A novel approach to develop microwave absorbing composites based on nano copper, nickel-iron alloy and epoxy within x-band region

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Microwave absorbing materials is a special class of materials for airborne application pertaining to stealth technology. Microwave absorbing materials have unique ability to neutralize incident microwave energy by absorption and scattering. Performance of the absorber depends on materials, thickness and measuring frequency. Soft magnetic materials along with conducting materials are the best combination to develop effective microwave absorber within the desired frequency range. In this work Nickel-Iron alloy and nano Copper first time attempted for microwave application. Nano Nickel-Iron alloy and nano Copper particles were synthesized and characterized with X-ray Diffraction and Field Emission Scanning Electron Microscopy. Energy Dispersive Spectroscopy analysis carried out to identify the elemental composition of Nickle-Iron alloy. Hysteresis behaviour of Nickle-Iron alloy studied with Vibrating Sample Magnetometer. The single layer composites microwave absorber with 2 mm thickness was fabricated with magnetic and conducting materials and Epoxy resin YD-128 and Hardener TETA as matrix. Signature properties of the composite absorbers like Reflection loss and Transmission loss were measured with Vector Network Analyser in X-Band frequency range (1-12 GHz) for comparison. Maximum reflection loss properties of nano-copper/epoxy composition shows -10.09 dB at 11.75 GHz and -3.6 dB at 9.43 GHz. Whereas Nickel-Iron alloy/epoxy composition shows maximum reflection loss -15.10dB at 11.75GHz and -14.04 dB at 9.5GHz. Moreover, Reflection loss values for Nano Copper/Nickel-Iron alloy/ Epoxy based absorber reached to -17.7 dB at 11.56 GHz, -16.34 dB at 11.39 GHz and -11.04 dB at 9.13 GHz. Use of both Nickel-Iron alloy and nano Copper materials changes electromagnetic properties of microwave absorber and there is an improvement of conducting and magnetic losses.

Biography

Sukanta Das has completed his MTech from Indian Institute of Technology Kharagpur and has completed his PhD from Institute of Technology (ISM) Dhanbad, India. He has been working as a Scientist for the last 15 years in Defence Research and Development Organization (DRDO), India. He has published research work in several reputed journals. At present, he is involved in project named Development of Wide Band RADAR Absorbing Materials.

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