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Design of RF Generator and Its Testing in Heating of Nickel Ferrite Nanoparticles

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Abstract : Cancer is a disease caused by an uncontrolled division of abnormal cells in a part of the body, which is affecting millions of people leading to death. Even though there have been tremendous developments taken place over the last few decades the effective therapy for cancer is still not a reality. The existing techniques of cancer therapy are chemotherapy and radio therapy which are having their limitations in terms of the side effects, patient discomfort, radiation hazards and the localization of treatment. This paper describes a novel method for cancer therapy by using RF-hyperthermia application of nanoparticles. We have synthesized ferromagnetic nanoparticles and characterized by using XRD and TEM. These nanoparticles after the biocompatibility studies will be injected in to the body with a suitable tracer element having affinity to the specific tumor site. When RF energy is applied to the nanoparticles at the tumor site it produces heat of excess room temperature and nearly 41-45°C is sufficient to kill the tumor cells. We have designed a RF source generator provided with a temperature feedback controller to control the radiation induced temperature of the tumor site. The temperature control is achieved through a negative feedback mechanism of the thermocouple and a relay connected to the power source of the RF generator. This method has advantages in terms of its effect like localized therapy, less radiation, and no side effects. It has several challenges in designing the RF source provided with coils suitable for the tumour site, biocompatibility of the nanomaterials, cooling system design for the RF coil. If we can overcome these challenges this method will be a huge benefit for the society.

Keywords : hyperthermia, cancer therapy, RF source generator, nanoparticles
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