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The Applications of the Duplex Stainless Steel as Hyperthermia Materials

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The use of Duplex stainless steel as a thermo-implant categorizes into two clinical applications: hyperthermia and thermal ablation or destruction. The goal of hyperthermia is to destroy the heat-sensitive abnormal cells and minimize normal cell death maintaining heat between 42°C and 46°C. Thermal ablation takes place when the local tissue temperature increases greater than 46°C. This elevated temperature denatures protein irreversibly resulting cellular death.

The author introduced several thermo-implants such as thermo-rod, thermo-stent, thermo-coil and thermo-acupuncture-needle. Those thermo-implants are made of duplex stainless steel which can produce regulated heat by itself within an induction magnetic field.

Thermal ablation characteristics of the thermo-rod on tumor hyperthermia depend on configurations of the thermo-rods and the magnitude of the induction magnetic strength. The exothermic properties of the thermo-implants can be characterized using the calorimetric test and the heat affected zone(HAZ) analyses in vitro.

Thermal radiation studies using thermo-coils and thermo-stents show the capability of the occlusion of animal blood vessels and inhibiting the proliferation of the abnormal smooth muscle cell growth and inflammatory cell reactions maintaining the heat between 42°C and 46°C minimizing a normal cell death in the study on external iliac artery of the New Zealand White (NZW) rabbit.

Thermal stimulation study using thermo-acupuncture needles suggests the potential applications of the automated acupunctural therapies.

Keywords: Hyperthermia, Duplex stainless steel, thermo implants, thermo rod, thermo stent, thermo coil, thermo acupuncture needle

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Polyvalent Nanoparticle-oligonudleotide conjugates: Synthesis, Properties, and Biodiagnostic/Therapeutic Applications

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Polyvalent nanoparticle-DNA conjugates exhibit a variety of unique features such as programmable assembly and disassembly, sharp melting transitons, intense optical properties, high stability, enhanced binding properties, and easy fabrication of the surface nature by chemical and physical modification. The unique properties of nanoparticle-DNA conjugates enable one to build up a number of versatile assay schemes for the detection of various targets. In addition, nanoparticle-RNA conjugates also demonstrate great promise of therapeutic applications in the context of RNA interference when combined with polymeric materials. In this presentation, representative examples of each aspect of nanoparticle-oligonucleotide conjugates will be discussed.

Keywords: Nanoparticle, DNA, RNA, Synthesis, Sensing, Therapeutics