Broadband to Monochromatic X-rays from High-Z Nanoparticles

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Abstract

X-ray machines in medical facilities produce bremsstrahlung radiation of low to high energy x-ray photons. A considerable amount of the high energy x-rays is unnecessary and is harmful to the patient exposed to it during therapy and imaging. The problem can be reduced by use of narrow band spectroscopic monochromatic x-rays at energies for maximum photo-absorption by the radiosensitizing agents or nanoparticles given to the patient. At maximum x-ray absorption the cascading eect of resonant uorescence (RFL) is initiated through ionization and Auger decay which result in enhanced electron ejections and photon emission needed for treatment and diagnostic imaging. We have used these facts to propose an ecient therapy and diagnostics titled Resonant Nano-Plasma Theranostics (RNPT) [1]. We predict these energies for High-Z nanoparticles, such as those used in cancer treatment. I will illustrate the RFL eect producing monochromatic x-rays, particularly for K x-rays (e.g. [1,2]), both theoretically and experimental observation. We have also proposed a mechanism to produce an enhanced source of monochromatic x-rays using the eect of K resonant uorescence (KFL) of nanoparticles. I will discuss this mechanism with a two-beam set-up [3].

1. Pradhan, Nahar, Montenegro et al J. Phys. Chem. A 113, 12356 (2009)
2. Montenegro, Nahar, Pradhan et al. J. Phys. Chem. A 113, 12364 (2009)
3. Nahar and Pradhan, J.Quant.Spec.Rad.Trans. (2015)
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