

Synthesis of BiOI nanoparticles toward potential contrast applications

G. D. M. H. Wijewardhana^{a*}, M. S. Kandanapitiye^b, M. N. M. Farhath^c

^{a,b}Department of Chemical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Sri Lanka

^cDepartment of Nanoscience Technology, Wayamba University of Sri Lanka, Sri Lanka

(^ahasanthikawijewardhana@gmail.com, ^bkkms@wyb.ac.lk, ^cmmohamed@seu.ac.lk)

Keywords: Biocompatible, contrast agents, non-radiative, X-ray attenuation coefficient.

The use of heavy metal-containing nanoparticles as potential X-ray contrast agents for the medical imaging of the human body, predates the advent of iodinated compounds because of their high X-ray attenuation power. Among the investigated heavy metals for contrast agents, Bi is the heaviest stable nonradiative metal element with a very high X-ray attenuation coefficient. There have been very few attempts to make hydrolytically stable Computerized Tomography (CT) active nanoparticles; Bismuth tends to form chalcogens among which Bi_2S_3 has been investigated to be used for a prospective CT contrasting agent. The said synthesis has given ultra-small nanoparticles, but they are hydrolytically unstable giving off a foul smelled toxic gas H_2S over time. However, the colloidal solution of BiOI NPs withstands mild acidic conditions, whereas the Bi_2S_3 is not stable in acidic condition. In this preliminary study, a unique decelerated hydrolytic procedure was developed for synthesizing biocompatible and ultrasmall PVP (polyvinylpyrrolidone) coated BiOI nanoparticles which are having a nearly spherical structure with an average size of ~ 2.7 nm. The phase purity and crystal structure of these prepared materials was determined by X-ray powder diffraction using bulk materials. The synthesized compound has a layered structure and is hydrolytically stable at neutral pH. Hence, the prepared BiOI nanoparticles can be an ideal material for potential CT contrast agents.