

Sintesis Nanopartikel Besi Platinum (Fe-Pt NPs) Menggunakan Metode Ablasi Laser sebagai Agen Kontras pada Computed Tomography (CT)

Oki Dimas Prasetya (24040116410004)

Abstrak

Sintesis nanopartikel platinum (Pt NPs) besi (Fe NPs) dan besi platinum (Fe-Pt NPs) telah berhasil dilakukan dengan menggunakan metode ablasi laser pulsa. Sintesis platinum di akuades menghasilkan koloid Pt NPs berwarna coklat gelap, dan akan berwarna cokelat dan lebih pekat saat frekuensi tembakan laser semakin tinggi. Sintesis nanopartikel besi di larutan *polyvinylpyrrolidone* (PVP) menghasilkan koloid Fe NPs berwarna kuning kemerahan. Sintesis Fe-Pt NPs di larutan PVP menghasilkan koloid Fe-Pt NPs berwarna coklat kekuningan. Karakterisasi Pt NPs, Fe NPs, Fe-Pt NPs telah berhasil dilakukan dengan menggunakan metode *Scanning Electron Microscope – Electron Dispersive X-ray spectroscopy* (SEM-EDX), *Transmission Electron Microscope* (TEM), *X-ray Diffraction spectroscopy* (XRD), dan *Ultraviolet-Visible spectroscopy* (UV-Vis). Hasil karakterisasi Fe-Pt NPs menunjukkan bahwa Fe-Pt NPs yang disintesis di larutan PVP terdiri atas senyawa Fe-Pt, berbentuk bulat (*spherical*) dengan diameter rata-rata 3,8 nm. Uji Fe-Pt sebagai agen kontras secara *in vitro* pada perangkat *computed tomography*(CT) dengan konsentrasi 6,5 mg/L, 13 mg/L, 26 mg/L, 52 mg/L. Penguatan kontras (C_{enh}) terbesar terjadi pada citra koloid Fe-Pt dengan konsentrasi 52 mg/L dimana peningkatan kontrasnya sebesar 260,981 %. Uji penguatan kontras juga dilakukan terhadap iodine sebagai kontras pembanding standar dengan konsentrasi yang sama. Penguatan kontras (C_{enh}) terbesar pada iodine terjadi pada konsentrasi 52 mg/L dimana peningkatan kontrasnya sebesar 243,574%. Didapatkan bahwa nilai peningkatan kontras Fe-Pt lebih baik dibandingkan dengan iodine.

Kata Kunci: Nanopartikel Platinum Besi, Metode Ablasi Laser Pulsa, Polyvinylpyrrolidone, Computed Tomography (CT), Penguatan Kontras.

Synthesis of Iron Platinum Nanoparticles (Fe-Pt NPs) Using Laser Ablation Method as Contrast Agent in Computed Tomography (CT)

Oki Dimas Prasetya (24040116410004)

Abstract

Ferrum nanoparticles (Fe NPs), Platinum nanoparticles (Pt NPs) and Ferrum Platinum nanoparticles (Fe-Pt NPs) have been successfully synthesized using the laser ablation method. The synthesis of platinum in aquades produced brownish Pt NPs, and it turned into darker brown as the laser repetition rate increased. The synthesis of ferrum in aquades produced reddish yellow Fe NPs. The Fe-Pt NPs synthesis in polyvinylpyrrolidone (PVP) solution produced darker brown Fe-Pt NPs colloids. The characterization of Pt NPs, Fe NPs, and Fe-Pt NPs was carried out by using *Scanning Electron Microscope - Electron Dispersive X-ray spectroscopy* (SEM-EDX), *Transmission Electron Microscope* (TEM), *X-ray Diffraction spectroscopy* (XRD), and *Ultraviolet-Visible spectroscopy* (UV-Vis). The characterization results showed that Fe-Pt NPs synthesized in polyvinylpyrrolidone (PVP) solution consist of Fe-Pt has spherical shape with diameter size about 3,8 nm. *In vitro* examination of Fe-Pt NPs as contrast agent to Computed Tomography (CT) modality has been performed with the

concentrations of Fe-Pt NPs were varied to 6,5 mg/L, 13 mg/L, 26 mg/L, and 52 mg/L . The highest contrast enhancement (C_{enh}) occurred in images of Fe-Pt NPs sample with concentration of 52 mg/L where in its contrast enhancements are 260,981. The contrast enhancement test is also performed on iodine as a standard contrast contrast with the same concentration. The increase in contrast enhancement (C_{enh}) in iodine occurred at a concentration of 52 mg / L where the contrast increase was 243.574%. It was found that the value of Fe-Pt contrast enhancement was better than iodine.

Keywords: Ferrum Platinum Nanoparticles, Laser Ablation Method, Polyvinylpyrrolidone, Computed Tomography (CT), Contrast Enhancement.

Pembimbing Akademik:

1. Ali Khumaeni
2. Kusworo Adi