Biomaterial mampu luruh berbasis Fe-Mn-C di produksi melalui proses metalurgi sebuk ferromangan, besi dan karbon

Rhidiyan Waroko, author

Abstrak

[ABSTRAK
Material Fe-Mn-C telah banyak dikembangkan sebagai material mampu luruh untuk aplikasi penyangga pembuluh dalam satu dekade belakangan ini. Penggunaan biomaterial Fe-Mn-C mampu menghindari tindakan pembedahan kembali setelah pembuluh jantung kembali normal setelah mengalami penyempitan, yaitu sekitar 6-12 bulan. Pengujian material Fe-Mn-C dilakukan untuk mencari kelayakan kandidat biomaterial ini digunakan sebagai penyangga pembuluh yang mampu luruh. Komposisi Mn digunakan sebagai variabel pengujian, yaitu Fe-25Mn-0.8C dan Fe-35Mn-0.8C. Material tersebut dibuat dengan cara pemaduan mekanik kemudian metalurgi serbuk. Karakterisasi serbuk hasil pemaduan mekanik menunjukkan terjadinya reduksi ukuran partikel dan membentuk paduan serbuk yang lebih merata. Hasil pengujian kekerasan dengan Rockwell A menunjukkan bahwa kekerasan material Fe-24Mn-0.42C adalah 43 HRA dan Fe-33Mn-0.27C adalah 49 HRA, nilai kekerasan tersebut memiliki nilai kekerasan yang lebih tinggi dari material SS 316L. Hasil pengujian polarisasi menunjukkan laju korosi untuk Fe-24Mn-0.42C adalah 0.84 mmpy dan Fe-35Mn-0.8C 0.34 mmpy. Nilai tersebut lebih tinggi dari besi murni tetapi lebih rendah dari paduan magnesium. Hasil uji mikrostruktur dengan uji metalografi dan uji XRD menunjukkan fasa austenit. Berdasarkan pengujian ini, menunjukkan bahwa pengaruh komposisi Mn untuk meningkatkan kekerasan material. Pada pengujian ini juga menunjukkan proses pemaduan mekanik mampu meningkatkan kekerasan material dan menurunkan laju korosi material.
ABSTRAK
Fe-Mn-C materials has been developed as biodegredable material for coronary stent application in recent decades. The use of Fe-Mn-C biomaterials is able to avoid surgery after heart vessels returned to normal condition after a constriction, which is about 6-12 months. Material testing of Fe-Mn-C alloy is performed to proving of feasibility that biomaterials candidate for biodegredable coronary stent. Mn composition is used for the test variable, namely Fe-25Mn-0.8C and Fe-35Mn-0.8C. That material is from production of mechanical alloying and then powder metallurgy. Powder as-mechanical alloying characterization shows particle reduction size and make a alloy powder is more evenly. Result of hardness test with Rockwell A showed the hardness of Fe-24Mn-0.42C is 43 HRA and hardness of Fe-33Mn-0.27C is 49 HRA. That hardness value is bigger than hardness value of SS 316 L material. The result of polarization test shows corrosion rate of Fe-24Mn-0.42C is 0.84 mmpy and 0.34 mmpy for Fe-33Mn-0.27C. That corrosion rate is higher than pure iron and lower than magnesium alloy. Microstructure test with

metallographic test and XRD test shows austenitic phase. Based on this research shows that effect of Mn composition is for increasing hardness value. On this research is shows that mechanical alloying can increasing hardness of material and decreasing corrosion rate., Fe-Mn-C materials has been developed as biodegredable material for coronary stent application in recent decades. The use of Fe-Mn-C biomaterials is able to avoid surgery after heart vessels returned to normal condition after a constriction, which is about 6-12 months. Material testing of Fe-Mn-C alloy is performed to proving of feasibility that biomaterials candidate for biodegredable coronary stent. Mn composition is used for the test variable, namely Fe-25Mn-0.8C and Fe-35Mn-0.8C. That material is from production of mechanical alloying and then powder metallurgy. Powder as-mechanical alloying characterization shows particle reduction size and make a alloy powder is more evenly. Result of hardness test with Rockwell A showed the hardness of Fe-24Mn-0.42C is 43 HRA and hardness of Fe-33Mn-0.27C is 49 HRA. That hardness value is bigger than hardness value of SS 316 L material. The result of polarization test shows corrosion rate of Fe-24Mn-0.42C is 0.84 mmpy and 0.34 mmpy for Fe-33Mn-0.27C. That corrosion rate is higher than pure iron and lower than magnesium alloy. Microstructure test with metallographic test and XRD test shows austenitic phase. Based on this research shows that effect of Mn composition is for increasing hardness value. On this research is shows that mechanical alloying can increasing hardness of material and decreasing corrosion rate.]