INTISARI

Stainless steel 316L merupakan salah satu material utama untuk aplikasi implan medis karena ketahanan korosi dan biokompatibilitasnya yang baik. Namun, sifat mekaniknya masih terbatas sehingga diperlukan upaya peningkatan melalui modifikasi permukaan. Penelitian ini bertujuan untuk mengetahui karakteristik *wettability*, kekasaran, kekerasan, dan struktur mikro *stainless steel* 316L pada perlakuan *shot peening* dan kombinasi *shot peening* dengan nitridasi plasma.

Perlakuan *shot peening* dilakukan dengan tekanan 12 bar pada variasi waktu 0, 10, 20, 30, 40, 50, dan 60 menit. Material tembak yang digunakan adalah bola baja berdiameter 0,6 mm dengan kekerasan 40-50 HRc. *Nozzle* berdiameter 5 mm dipasang pada jarak 6 cm terhadap spesimen dengan sudut tembak 90°. Selanjutnya, spesimen terpilih dikombinasikan dengan nitridasi plasma pada temperatur 400 °C selama 200 menit. Karakterisasi meliputi pengukuran sudut kontak *wettability*, kekasaran permukaan menggunakan *surface roughness tester*, pengujian kekerasan mikro dengan metode Vickers, serta pengamatan struktur mikro melalui mikroskop optik.

Hasil penelitian menunjukkan bahwa kombinasi *shot peening* dan nitridasi plasma menyebabkan kenaikan kekasaran permukaan hingga mencapai 2,238 µm pada durasi 10 menit dan mengalami penurunan setelahnya. Sudut kontak mengalami penurunan dengan nilai terkecil mencapai 59,64° pada perlakuan kombinasi. Nilai kekerasan juga meningkat signifikan, dengan kekerasan maksimum 513,68 HV pada perlakuan kombinasi, lebih tinggi dibandingkan perlakuan tunggal *shot peening* sebesar 385 HV. Pengamatan struktur mikro memperlihatkan pengecilan ukuran butir dan terbentuknya zona deformasi plastis hingga kedalaman 184,13 µm, serta lapisan hasil difusi nitrogen yang memperluas zona pengerasan.

Kata kunci: *Stainless steel* 316L, *shot peening*, nitridasi plasma, *wettability*, kekasaran permukaan, kekerasan, struktur mikro

ABSTRACT

Stainless steel 316L is one of the primary materials for biomedical implant applications due to its excellent corrosion resistance and biocompatibility. However, its mechanical properties remain limited, requiring improvement through surface modification. This study aims to investigate the characteristics of wettability, surface roughness, hardness, and microstructure of stainless steel 316L subjected to shot peening and the combination of shot peening with plasma nitriding.

The shot peening treatment was carried out at a pressure of 12 bar with time variations of 0, 10, 20, 30, 40, 50, and 60 minutes. The blasting media used were steel balls with a diameter of 0.6 mm and a hardness of 40–50 HRC. A 5 mm nozzle was positioned at a distance of 6 cm from the specimen at a perpendicular impact angle of 90°. Selected specimens were subsequently treated with plasma nitriding at 400 °C for 200 minutes. Characterization included contact angle measurement for wettability, surface roughness evaluation using a surface roughness tester, microhardness testing with the Vickers method, and microstructural analysis using an optical microscope.

The results showed that the combination of shot peening and plasma nitriding increased the surface roughness up to 2.238 µm at 10 minutes of treatment, followed by a decrease at longer durations. The contact angle decreased, with the lowest value reaching 59.64° under the combined treatment. Hardness increased significantly, with a maximum value of 513.68 HV in the combined treatment, higher than that of single treatment shot peening 385 HV. Microstructural observation revealed grain refinement and the formation of a plastically deformed layer up to a depth of 184.13 µm, along with a nitrogen diffusion layer that broadened the hardened zone.

Keywords: *Stainless steel 316L, shot peening, plasma nitriding, wettability, surface roughness, hardness, microstructure*