

## INTISARI

Dalam bidang biomedis, *stainless steel* 316L banyak digunakan sebagai material implan karena ketahanan korosi dan biokompatibilitasnya yang baik. Namun, sifat mekanik dan ketahanan ausnya masih terbatas, terutama untuk penggunaan jangka panjang di lingkungan biologis. Oleh karena itu, diperlukan modifikasi permukaan untuk meningkatkan performa material. Penelitian ini bertujuan untuk mengetahui pengaruh variasi waktu *shot peening* terhadap karakteristik sifat fisis dan mekanis *stainless steel* 316L yang telah mengalami proses nitridasi plasma.

Proses *shot peening* dilakukan pada tekanan 12 bar dengan variasi waktu 0, 10, 20, 30, 45, dan 60 menit, menggunakan bola baja berdiameter 0,6 mm dengan kekerasan 45 HRC. Spesimen kemudian dikombinasikan dengan proses nitridasi plasma pada suhu 400 °C selama 100 menit. Karakterisasi meliputi pengujian sudut kontak (*wettability*), kekasaran permukaan, kekerasan mikro Vickers, dan pengamatan struktur mikro.

Hasil penelitian menunjukkan bahwa kombinasi *shot peening* dan nitridasi plasma menurunkan sudut kontak hingga 63,90°, yang menandakan peningkatan sifat hidrofilik permukaan. Nilai kekasaran maksimum tercapai pada 2,078 µm pada durasi 10 menit, sedangkan kekerasan tertinggi mencapai 508,64 HV pada durasi 60 menit, lebih tinggi dibandingkan perlakuan *shot peening* tunggal sebesar 394,10 HV. Struktur mikro menunjukkan pengecilan ukuran butir, peningkatan densitas dislokasi, serta terbentuknya lapisan nitrida tipe *expanded austenite (S-phase)* hingga kedalaman 182,29 µm.

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

## ABSTRACT

*In the biomedical field, stainless steel 316L is widely used as an implant material due to its excellent corrosion resistance and biocompatibility. However, its mechanical strength and wear resistance remain limited, especially for long-term applications in biological environments. Therefore, surface modification is required to enhance its performance. This study aims to investigate the effect of shot peening duration on the physical and mechanical characteristics of stainless steel 316L subjected to plasma nitriding.*

*The shot peening process was carried out at a pressure of 12 bar with treatment durations of 0, 10, 20, 30, 45, and 60 minutes, using steel balls with a diameter of 0.6 mm and a hardness of 45 HRc. The specimens were subsequently treated with plasma nitriding at 400 °C for 100 minutes. Characterization included contact angle (wettability) testing, surface roughness measurement, Vickers microhardness testing, and microstructural observation.*

*The results showed that the combination of shot peening and plasma nitriding reduced the contact angle to 63,90°, indicating improved surface hydrophilicity. The maximum surface roughness of 2.078 μm was obtained at 10 minutes, while the highest hardness of 508.64 HV was achieved at 60 minutes, higher than that of single shot peening (394.10 HV). Microstructural analysis revealed grain refinement, increased dislocation density, and the formation of an expanded austenite (S-phase) layer extending to a depth of approximately 182.29 μm.*

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