ABSTRAK

Paduan Co-Cr-Mo merupakan salahsatu material implan yang digunakan sebagai pengganti tulang manusia. Terdapat kekurangan sifat material yang dimiliki pada *as-cast* paduan Co-Cr-Mo yaitu kekerasan yag kurang dari kekerasan tulang, keuletan yang buruk, dan kekuatan fatigue yang rendah. Penelitian ini menggunakan paduan Co-Cr-Mo (ASTM F75) hasil *investment casting*. Paduan kemudian dilakukan *solution treatment* pada temperatur 1275°C selama 5 jam. Kemudian material dilakukan proses aging pada temperatur 800, 850, dan 900°C selama 5jam kemudian di-*quench* dengan media air. Selanjutnya material dilakukan uji kekerasan dengan metode Vickers. Analisa hasil penelitian serta penelusuran referensi menunjukkan waktu tahan *aging* semakin lama akan menyebabkan distribusi dan bentuk presipitat akan semakin halus. Kelarutan presipitat akan meningkat seiring peningkatan waktu tahan pada proses *aging.* Penambahan unsur karbon dan nitrogen mempengaruhi peningkatan presipitat selama proses perlakuan panas *solution treatment* dan *aging.* Struktur mikro yang terbentuk akibat proses perlakuan panas dapat meningkatkan pembentukan presipitat akan tetapi diameter *grain size* semakin kecil serta membentuk presipitat tipe M_2X, fasa π, dan $M_{23}X_6$. Kekerasan paduan meningkat secara linear dengan jumlah fase hcp yang terbentuk selama *aging* dan tidak tergantung pada temperatur *aging.* Nilai kekerasan dari setiap sampel pasca perlakuan aging selama waktu tahan aging mengalami penurunan.

Kata Kunci : Paduan Co-Cr-Mo, *as-cast, solution treatment, aging,* mikrostruktur, sifat mekanik.

ABSTRACT

The Co-Cr-Mo alloy is one of the implant materials used as a substitute for human bone. There are deficiencies in the material properties possessed by the as-cast Co-Cr-Mo alloy, namely less hardness than bone hardness, poor ductility, and low fatigue strength. This study uses an alloy of Co-Cr-Mo (ASTM F75) from investment casting. The alloy was then subjected to solution treatment at a temperature of 1275°C for 5 hours. Then the material is aged at a temperature of 800, 850, and 900°C for 5 hours and then quenched with water media. Furthermore, the material is subjected to a hardness test using the Vickers method. Analysis of research results and reference tracing shows that the longer the aging resistance time will cause the distribution and shape of the precipitates to be smoother. The solubility of precipitates will increase with increasing holding time in the aging process. The addition of carbon and nitrogen elements affects the increase in precipitates during the heat treatment process of solution treatment and aging. The microstructure formed as a result of the heat treatment process can increase the formation of precipitates but the smaller grain size and form precipitates of type M_2X, phase, and $M_{23}X_6$. The hardness of the alloy increases linearly with the number of hcp phases formed during aging and does not depend on the aging temperature. The hardness value of each sample after aging treatment during the aging resistance time decreased.

Keyword: Co-Cr-Mo alloy, aging, microstructure, precipitate,