

# Studi Pengaruh Penambahan Aditif Asam Borat dan Asam Sitrat terhadap Sifat Mekanis Ultra Low Cement Castable = Effects of Boric Acid and Citric Acid as Additives on Mechanical Properties of Ultra Low Cement Castable

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## Abstrak

Kebutuhan akan material refraktori terus meningkat seiring dengan berkembangnya industri logam. Material refraktori digunakan sebagai pelapis (bahan Isolator) tungku peleburan. Penggunaan material refraktori sangat penting dikarenakan materialnya yang memiliki sifat mekanis yang baik, tahan terhadap temperatur tinggi dan tidak bereaksi dengan material lain. Pada penelitian ini menggunakan refraktori jenis Ultra Low Cement Castable (ULCC) yang ditambahkan dengan aditif yang berfungsi sebagai retarder. Aditif yang digunakan adalah asam borat dan asam sitrat. Penelitian ini dilakukan dengan memvariasikan kadar aditif asam borat dan asam sitrat untuk melihat sifat mekanis ULCC. Variasi asam borat dan asam sitrat yang digunakan adalah 0,1% wt, 0,3% wt dan 0,5% wt. Kadar air yang digunakan pada penelitian kali ini sebanyak 5,3% wt yang ditetapkan sebagai variabel tetap. Sampel diuji dengan pengujian Cold Crushing Strength (CCS), Modulus of Rapture (MOR), Permanent Linear Change (PLC) dan Bulk Density. Selanjutnya dilakukan karakterisasi FTIR, XRD, XRF dan SEM. Hasil penelitian ini menunjukkan bahwa terdapat sifat mekanis yang baik terhadap penambahan asam borat sebanyak 0,3% wt. Sedangkan ULCC dengan penambahan asam sitrat menghasilkan sifat mekanis yang rendah. Penggunaan aditif asam borat sangat berguna untuk menjaga konsistensi pada campuran ULCC.

.....The need for refractory materials continues to increase along with the development of the metal industry. Refractory materials are used as coatings for smelting furnaces. The use of refractory materials is very important because the material has good mechanical properties, high-temperature resistant, and does not react with other materials. In this study, Ultra Low Cement Castable (ULCC) refractories were used which were added with additives that functioned as retarders. The additives used are boric acid and citric acid. This research was conducted by varying the additives of boric acid and citric acid to the mechanical properties of ULCC. Variations of boric acid and citric acid used were 0.1% wt, 0.3% wt, and 0.5% wt. The water content used in this study was 5.3% wt which was set as a fixed variable. Samples were tested by testing Cold Crushing Strength (CCS), Modulus of Rupture (MOR), Permanent Linear Change (PLC), and Bulk Density. Furthermore, the characterization of FTIR, XRD, XRF, and SEM was carried out. The results of this study indicate that there are good mechanical properties to the addition of boric acid as much as 0.3% wt. While ULCC with the addition of citric acid produces low mechanical properties. The use of boric acid additives is very useful to maintain the consistency of the ULCC mixture.