Aplikasi metode electrochemical impedance spectroscopy untuk mengukur laju korosi baja tulangan pada beton berbahan tambah dross aluminium di lingkungan klorida = Application of electrochemical impedance spectroscopy method to measure corrosion rate of reinforced bar on aluminum dross concrete in the chloride environment

Wahyu Budiarto, author

Abstrak

Dross aluminium yang dihasilkan oleh industri peleburan aluminium dapat menyebabkan polusi udara dan pencemaran lingkungan, untuk itu pemanfaatan ulang dross aluminium sebagai pengganti sebagian pasir pada struktur beton diharapkan bisa mengurangi masalah lingkungan yang ditimbulkan dan bisa menjadi sumber bahan baku alternatif pengganti pasir. Dampak fraksi filler dross aluminium 0%, 5% dan 8% terhadap kekuatan tekan dikarakterisasi dengan compressive strength test pada umur beton 1, 3, 7 dan 28 hari. Ketahanan korosi struktur beton dipelajari dengan potentiodyanamic polarization dan electrochemical impedance spectroscopy. Kandungan ion klorida dianalisis menggunakan X-ray fluorescence spectrometry per ketebalan 10 mm dan perubahan struktur setelah siklus dry-immerse beton di lingkungan klorida selama 30, 60 dan 90 hari dievaluasi dengan scanning electron microscope. Hasil investigasi sifat mekanik beton menampilkan kekuatan tekan cenderung menurun dengan naiknya fraksi dross aluminium. Hasil uji elektrokimia menampilkan ketahanan korosi cenderung meningkat dengan naiknya fraksi dross aluminium, selain itu hasil polarisasi potensiodinamik juga menampilkan perpanjangan rentang pasivasi baja tulangan. Hasil karakterisasi X-ray fluorescence spectrometry menunjukkan peningkatan ion klorida terhadap waktu paparan dan kenaikan fraksi dross aluminium. Pengamatan struktur mikro membuktikan bahwa peningkatan konsentrasi ion klorida dipengaruhi oleh pola retak dan munculnya rongga udara dalam struktur beton. Kesimpulan menunjukkan bahwa modifikasi konsentrasi dross aluminium memiliki pengaruh yang sangat signifikan terhadap struktur beton, kekuatan tekan dan ketahanan korosi.
.....Aluminum dross was produced by the aluminum smelting industry can induce air pollution and environmental defilement, therefore reused of aluminum dross as a partial replacement of sand in a concrete structure is intended to diminish the environmental problems and it can be an option source of raw material to replace sand. The impact of aluminum filler fraction of 0%, 5% and 8% on compressive strength was analyzed by compressive strength tests on concrete age of 1, 3, 7 and 28 days. Corrosion resistance of concrete structures was studied by potentiodyanamic polarization and electrochemical impedance spectroscopy. The chloride ion content was analyzed using X-ray fluorescence spectrometry every 10 mm thickness and structure evolution after concrete dry-immerse in the chloride environment for 30, 60 and 90 days were evaluated by scanning electron microscope. The results of the mechanical properties examination indicated compressive strength tend to alleviate with the increase the aluminum dross fraction. Electrochemical test results display that corrosion resistance tends to increase with increasing aluminum dross fraction, furthermore, potentiodynamic polarization results also indicate an extended range of reinforced bar passivation. The results of X-ray fluorescence spectrometry characterization showed a chloride ions enhancement towards the exposure time and aluminum dross fraction escalation. Micro structure verification prove that the concentration of chloride ions escalation is influenced by crack patterns

and the appearance of air cavities in concrete structures. The consequences illustrate the strong influence of aluminum dross on concrete structure, compressive strength and corrosion resistance of concentrate modification.