

Prompt gamma analysis of chlorine in concrete for corrosion study

Naqvi A.A., Nagadi M.M., Al-Amoudi O.S.B.

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Abstract: Measurement of chlorine in concrete is very important for studying of corrosion of reinforcing steel in concrete. Corrosion of reinforcing steel is primarily ascribed to the penetration of chloride ions to the steel surface. Preventive measures for avoiding concrete structure reinforcement corrosion requires monitoring the chloride ion concentration in concrete so that its concentration does not exceed a threshold limit to initiate reinforcement concrete corrosion. An accelerator based prompt gamma neutron activation analysis (PGNAA) setup has been developed for non-destructive analysis of elemental composition of concrete samples. The setup has been used to measure chlorine concentration in concrete samples over a 1-3 wt% concentration range. Although a strong interference has been observed between the chlorine ^{35}Cl -rays and calcium ^{40}Ca -rays from concrete, the chlorine concentration in concrete samples has been successfully measured using the 1.164 and 7.643 MeV chlorine ^{35}Cl -rays. The experimental data were compared with the results of the Monte Carlo simulations. An excellent agreement has been achieved between the experimental data and results of Monte Carlo simulations. The study has demonstrated the successful use of the accelerator-based PGNAA setup in non-destructive analysis of chlorine in concrete samples. 2005 © Elsevier Ltd. All rights reserved.