Monitoring reinforcement corrosion and corrosion-induced cracking using non-destructive x-ray attenuation measurements

To test the applicability of the x-ray attenuation method to monitor the movement of corrosion products as well as the formation and propagation of cracks in cementitious materials reinforced mortar samples were prepared and tested under accelerated corrosion conditions. It is evident from the experimental results that the x-ray attenuation method is suitable to track time-dependent movements of the corrosion products and the subsequent development (formation and propagation) of corrosion-induced cracks. The x-ray attenuation measurements allowed determination of the actual concentration of the corrosion products averaged through the specimen thickness. The total mass loss of steel, obtained by the x-ray attenuation method, was found to be in very good agreement with the mass loss obtained by gravimetric method as well as Faraday's law.