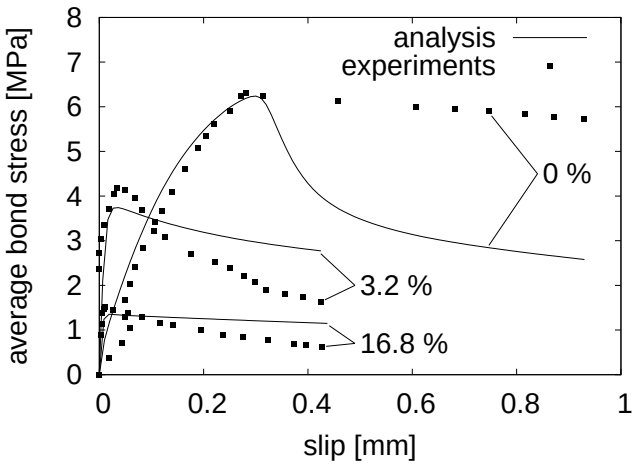

Figure 7: Comparison of predicted average bond stress-slip curves and experimental data reported by Lee et al. (2002) for three corrosion percentages $\rho_c = 0$, 3.2 and 16.8 %.

post-peak response might be expected across all three cases. More studies are required to explore this observation.

For the analyses without corrosion, the crack patterns for the peak bond stress and the maximum slip (presented in Figure 7) are shown in Figure 8. Crack patterns are visualised as those middle cross-sections of lattice elements in which the norm of the crack opening vector is greater than 10 μm and increasing. Thus, only active cracks are presented.

At the peak of the average bond stress-slip curve, the concrete cover is cracked at its thinnest section (Figure 8a). With further slip, additional cracks initiate from the reinforcement and propagate radially into the specimen as shown in Figure 8b.

In Figure 9 the crack patterns are shown, for the two corrosion cases, at the end of the corrosion process. For both corrosion cases, cracking of the concrete cover occurs before the pullout, which corresponds to the observations reported in the literature (Lee et al. 2002).

4 CONCLUSIONS

In the present work a lattice approach is used to describe the mechanical interaction of a corroding reinforcement bar, the surrounding concrete and the interface between steel reinforcement and concrete. The cross-section of the ribbed reinforcement bar is taken to be circular, assuming that the interaction of the ribs of the deformed reinforcement bar and the surrounding concrete is included in a cap-plasticity interface model. This lattice approach is capable of representing many of the important characteristics of corrosion induced cracking and its influence on bond. The idealisation of the corrosion expansion as an eigenstrain allows for the modelling of corrosion induced cracking. Furthermore, the frictional bond law can model

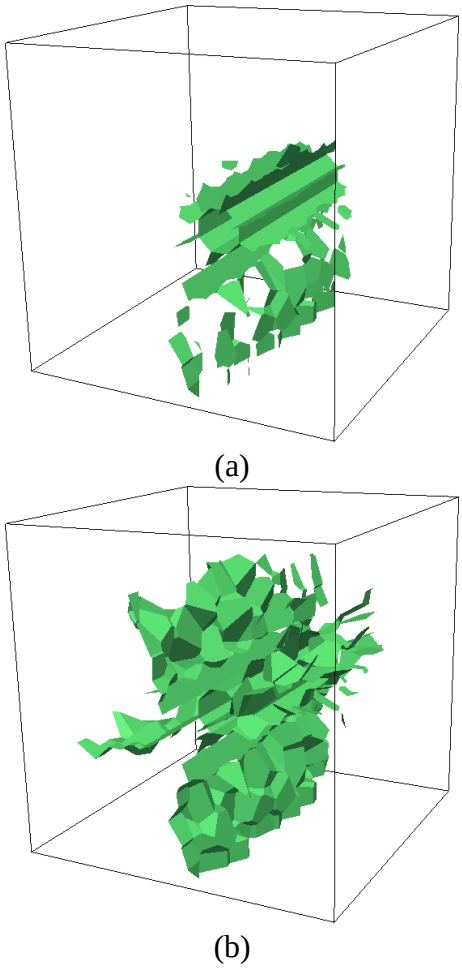

Figure 8: Crack patterns for the pullout analysis for the corrosion-free case at (a) peak and (b) end of the average bond stress slip curve. Cracks initiate at the interface between reinforcement and concrete and propgate to the specimen surface.

the decrease of the bond strength if the concrete is pre-cracked. Very good agreement with experimental results in the pre-peak regime of the bond stress-slip curves was obtained. More studies are required to investigate the post-peak response of the bond stress-slip curves. Also, further studies will be performed to investigate the influence of the element length of the interface between reinforcement and concrete on the analyses results. Also, we will study the influence of the stiffness of the lattice elements on corrosion induced cracking and its interplay with lateral confinement.

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