**Supplementary files**

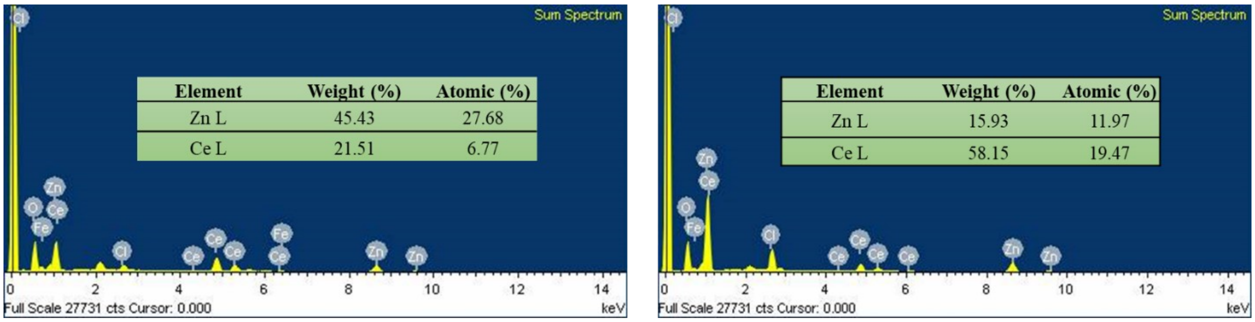


Figure 1. EDS measurements of specimens immersed in Cerium salts sealing coating bath (a) 30,000 PPM (b) 100,000 PPM

The EDS measurement of specimen immersed in 30,000 PPM and 100,000 PPM are shown in Figure 1. The weight (%) of Zn and Ce for specimens immersed in 30,000 PPM and 100,000 PPM were 43.43 %, 15.93 % and 21.51%, 58.15% respectively.

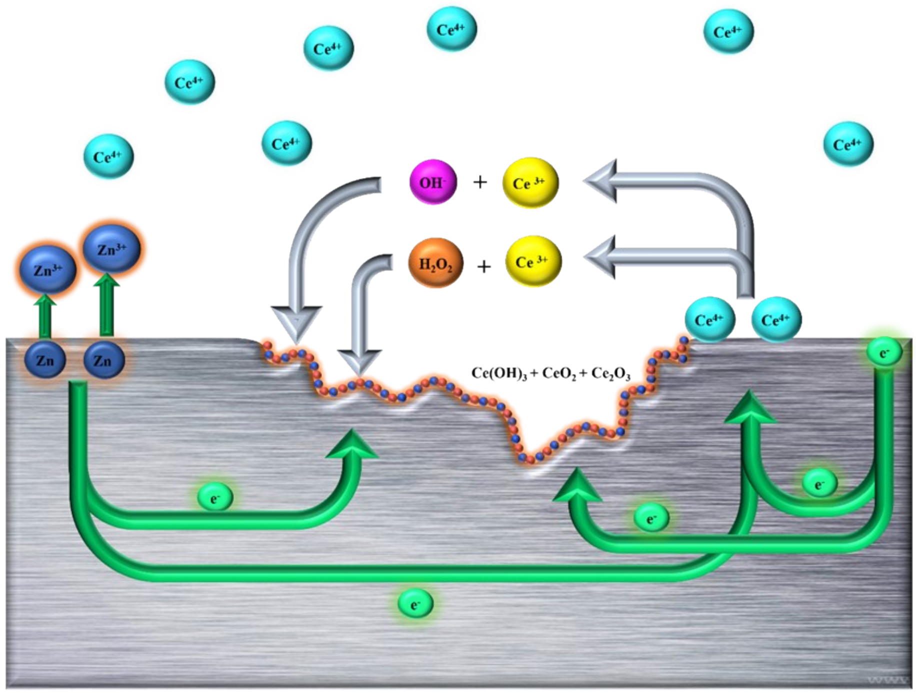


Figure 2. Schematic of protection mechanism of sealing coating

The Corrosion causes an increase in electron loss on the pin surface. The presence of $H_2O_2$ in the sealing coating accelerates reduction or oxidation to $OH^-/O_2$, resulting in more $Ce(OH)_2^{2+}$. The $Ce^{3+}$ and $Ce^{4+}$ precipitates produce a thick dense layer of Ce precipitate over pin preventing corrosion of pin surface. The equations supporting the mechanism are following:

$$Zn \rightarrow Zn^{2+} + 2e^- \quad (1)$$

$$H_2O_2 + 2e^- \rightarrow 2OH^- \quad (2)$$

$$2H_2O_2 \rightarrow 2O_2 + 2H_2O \quad (3)$$

$$4Ce^{3+} + O_2 + 4OH^- + 2H_2O \rightarrow 4Ce(OH)_2^{2+} \quad (4)$$

$$Ce(OH)_2^{2+} + 2OH^- \rightarrow CeO_2 + 2H_2O \quad (5)$$

$$Ce^{3+} + OH^{-} \rightarrow Ce(OH)_3 \quad (6)$$

$$2Ce(OH)_3 \rightarrow Ce_2O_3 + 3H_2O \quad (7)$$