Fe examples :

$Fe \rightarrow Fe^{2+} + 2e^-$, $Fe^{2+} + 2H_2O + 2Cl^- \rightarrow Fe(OH)_2 + 2HCl$

$FeOOH + H_2O \rightarrow Fe^{3+} + 3OH^-$

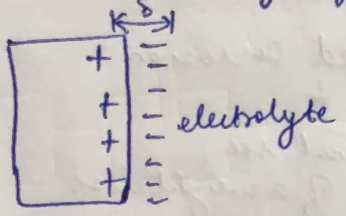
$FeOOH + Cl^- \rightarrow FeOCl + OH^-$

$FeOCl + H_2O \rightarrow Fe^{3+} + Cl^- + 2OH^-$

POST-MINOR 2

LECTURE 21 (28/03/2023) : { Given in Lecture Slides }

NOTE: In electrochemical setups, capacitance can form commonly due to presence of surface charges



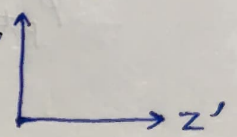
* NOTE: In Major : Complete syllabus

NOTE: Pitting very commonly occurs in Cl^- environment

LECTURE 22 (01/04/2023)

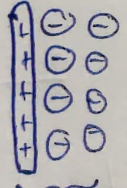
42] Ny-quist Plot (Impedance, $Z = Z' + iZ''$)

↓ this is the plot b/w Real part of Impendance and Imaginary part of Impendance



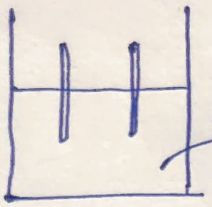
* { The Z' value represents Resistance }

43] Electrochemical Double Layer (EDL) → In reality the electrochemical cell behaviour is not so simple ↓ it also has some capacitance



due to double layer formation → we call this : Electrochemical Double Layer Capacitance (EDLC) *

44]

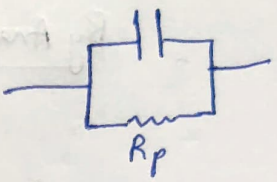


R_e : resistance of electrolyte

Capacitance : from EDLC

R_p : resistance due to the exchange of e's ("exchange resistance") OR "Polarization Resistance" OR "Faraday Resistance"

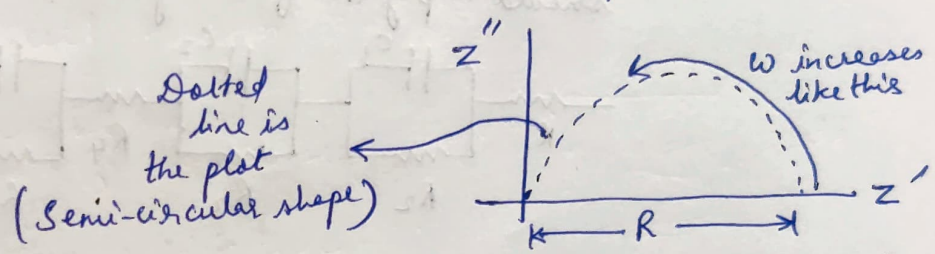
Generally this is always parallel to capacitance :



R_p

⇓

the plot for this will be :



Dotted line is the plot (Semi-circular shape)

Z″

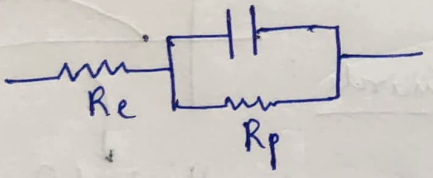
Z′

ω increases like this

R

(at min^m & max^m ω, Z″ is 0)

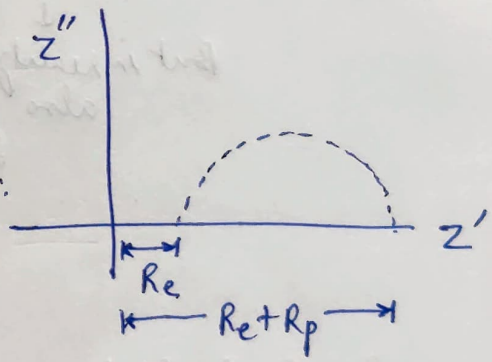
Now, for the case we have with R_e, R_p and Capacitance :



R_e

R_p

⇒ the plot obtained is :



Z″

Z′

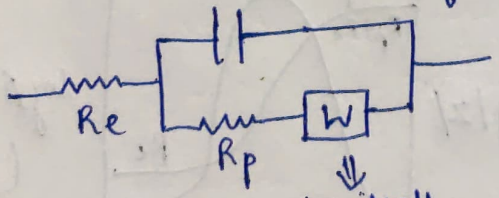
R_e

$R_e + R_p$

45] There are two types of Polarization < Activation / Concentration (i.e. Diffusion based)

⇓

if this occurs : it leads to extra resistance called "Warburg Resistance"

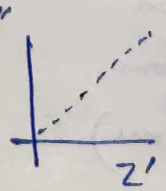


R_e

R_p

W

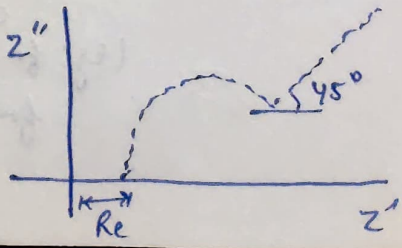
⇓ by itself it has this kind of effect :



Z″

Z′

⇒ thus overall :



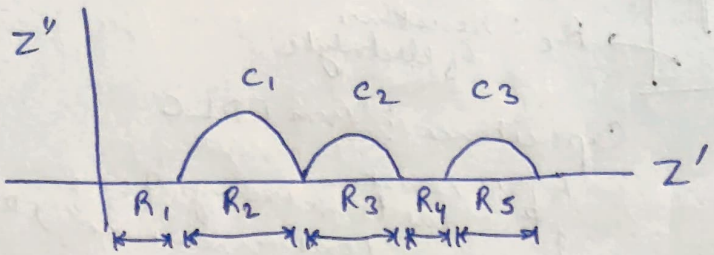
Z″

45°

R_e

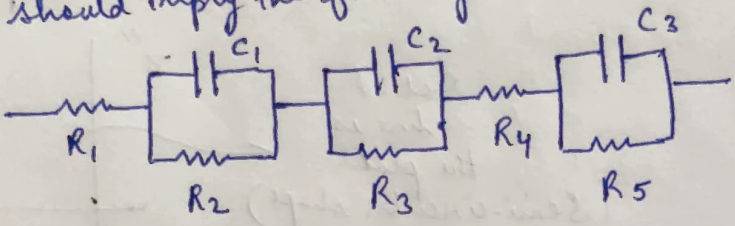
Z′

eg: We have some output plot given:

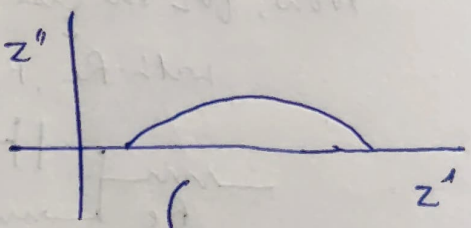


By Analysis: There are 3 semicircles
↓
thus 3 capacitors

Thus, the plot should imply the following circuit:

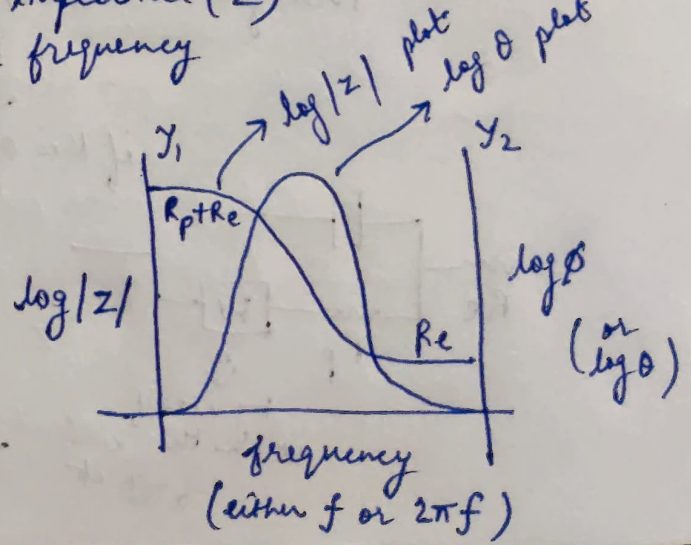


NOTE: Here we are observing perfect Semicircles
↓
But in reality we may also observe Depressed semicircle:



this kind of curve is observed in Solar cells

46] Bode Plot
↓
Plot involving phase (ϕ), impedance (Z) and frequency
↓
it is a Double-y plot
↓
there will be two curves drawn.
(eg: for y_1 → in blue colour
for y_2 → in red colour)



LECTURE 23

{Given in Lecture Slides : Topic – Crevice Corrosion}

LECTURE-24

{Given in Lecture Slides}

* All lectures here onwards are given in slides.