5.1 Introduction

“Corrosion” can be understood as the conversion of a material into its oxide, hydroxide or sulphide form due the exposure in air or moisture, or in other environments (liquids/ gasses/ chemicals/ electrolytes, body fluids, etc.). Generally the term corrosion is used for metals and their alloys. But it can also occur in materials other than pure metals, like metallic glasses, polymers, composite, etc. Corrosion, in all materials, involves natural degradation of a material in the environment, through a series of chemical or electrochemical reactions. The aggressive action of environment, in which the material is kept, deteriorates its potential properties like strength and appearance. Corrosion generates at a crack of a material and spreads throughout the surface. A crystalline material constitutes crack in the form of lattice defects, impurities, etc. The surface of a crystalline material, therefore, is heterogeneous due to the presence of different sized grains. In crystalline materials this inhomogeneity act as a source of corrosion, which is absent in amorphous materials due to their homogeneous nature. Different metals have different competencies towards corrosion. A noble metal is less competent for corrosion and vice versa. In principle it acts on the exposed surface of any material, as it is a diffusion-controlled process. Due to this, methods like passivation and chromate conversion that lessen the surface activity are used to protect materials from corrosion. Passivation refers to the formation of a protective layer, on the metal surface, which barely contains the original metal. The protective layer, also known as the passive layer, acts as a skin of the material which is composed of the oxide form of the material inside. Structurally, this passive layer on the metal surface may be crystalline or amorphous, and its composition may change from surface to metal contact. In other words the structure, composition, and thickness of passive layer are dependent on the type of material and its environment. Passivation changes the kinetics of the electrochemical reaction occurring at anode due to the oxide layer on the surface of the material. The electrochemical reactions involve anodic and cathodic reactions. Anodic reactions includes the ionization of metals and cathodic reactions implies the reduction reactions involving the liberation of hydrogen ions or formation of oxygen ions [5.1].

The homogenous structure of amorphous alloys make them more corrosion resistant as compared to their crystalline counterparts. In order to make use of these amorphous materials in high temperatures, oxidizing environments and in corrosive media, we need to know about their corrosion resistance in different chemicals and bio-fluids. Several studies on corrosion of metallic glasses in various aqueous media, such as NaCl, HNO_3, H_2SO_4, NaOH, etc., have been done by conducting potentiodynamic tests, in order to find their stability towards the degradation process in any environment, so that their possible applications can be explored [5.2-5.4]. Naka et al [5.5] studied the corrosion behaviour of $Ti_{50}Cu_{50}$ and $Zr_{50}Cu_{50}$ amorphous alloys and their corresponding crystalline counter parts in different media. Their study showed that the crystalline alloys were more susceptible towards corrosion than the amorphous alloys.

5.1.1 Bulk Metallic Glasses (BMGs) as Biomaterials

Amorphous alloys, metallic alloys, ceramics and polymers are the most common functional materials used as implants after failure of certain parts (bones) of the human body. The biomedical field requires material with high strength, load bearing capacity, high elastic strain limit and anti-corrosive property in bio-fluids. The materials used as bio-implants are exposed to the chemical, biological, mechanical and thermal forces inside a human body. These forces alter the functionality and durability of implant materials in negative ways. The degradation of implant material, in turn, affects the body adversely in the following ways:

a) The corroded material may react with the surrounding tissues and cause inflammation
b) The corroded material may get dissolved and can get transferred to other organs and react with them adversely.

c) The movement of electrons in the implant material due to corrosion may hamper the natural movement of ions in bio-fluids.

Due to these reasons the susceptibility of any implant material towards corrosion must be known beforehand.

The homogenous structure of bulk metallic glasses (BMGs) give rise to the remarkable properties of BMGs such as strength, high elastic strain limit, ability to be cast in different shapes and high corrosion resistance [5.6-5.7]. BMGs are more compatible with the human bone since they have low elastic moduli (50-100 GPa), as compared to the commercially available implants, due to which they have low stress shielding effect [5.8-5.9]. These properties make them a suitable candidate for load bearing implant materials, such as knee and hip joints, as well as dental implants. Now a days a variety of metallic alloys are used as prosthetic materials, dental implants and fillings, knee and hip joint replacements, etc. The biocompatibility of the BMGs have been tested for a wide variety of BMGs [5.10-5.14] and they have shown that BMGs are more biocompatible as compared to the commercially available bio-implants such as Ti-6Al-4V.

Conventional bio-implants are stainless steel (316L), Co-Cr-Mo and Ti-6Al-4V. But these implants have some limitations associated with them. Stainless steel implants release Fe, Cr and Ni ions when corroded, which may result in allergic reactions or have poisonous effects on neighbouring tissues. Co-Cr-Mo alloys may cause inflammation in surrounding tissues of the implant as the Co ions gets dissolved in bio-fluids due to corrosion, leaving behind the Mo ions [5.15]. It is known that the presence of toxic and carcinogenic elements, such as Ni or Be, degrades the bio-compatibility of BMGs [5.11-5.14, 5.16-5.17]. Keeping this in mind many studies have been done and novel materials have been designed with good biocompatibility [5.18-5.19]. Few Zr- based materials are proved to have better bio-corrosion resistance than stainless steel and Ti-based alloys [5.20-5.25]. Schroers et al [5.8] have proved the non-toxic and compatible behaviour of Ni containing Pt- and Zr-based BMGs towards the cell growth and tissue function. A new Ti-based BMG was proposed by Wang et al [5.26] having excellent mechanical and bio-corrosive properties.

5.1.2 Bio-fluids

Human body contains fluids that are essential for its proper functioning, such as saliva for digestion of food and lubrication, blood plasma to carry and transport essential proteins and blood cells throughout the body, etc. These fluids impose a corrosive media on the implant materials and thereby degrade their functionality and durability. Apart from these fluids, some other fluids also hamper the stability of the implant, directly or indirectly, by inducing corrosive environment in the vicinity of the implant. These fluids include the balanced saline solution (BSS) and phosphate buffered solution (PBS). Both of them are used for proper functioning and treatment of damaged human tissues.

Saliva: The moistness and temperature fluctuations in mouth makes it a highly corrosive environment for any implant material. A wide variety of food one intakes, varies to a wide pH range. Moreover, the food breakdown is facilitated by the secretion of acids in mouth. Due to this the implant material has to face an accelerated reaction between it and the oral media. The oral media constitutes the saliva (chloride or fluoride ions, micro-organisms, etc.) along with the neighbouring tissues. This oral media acts as electrolyte that has strong corrosive effects on the implant material. The corrosion potential of saliva increases with the decrease in its pH and increase in chloride concentration [5.27]. The pH of the mouth (6.2-7.2) is maintained by saliva, i.e., it balances the acidity in mouth and also prevents the dissolution of minerals in the hard dental tissues [5.28].

Blood Plasma: Blood runs throughout the human body and blood plasma takes 55% of total blood volume of the body [5.29]. Blood plasma is the liquid component of blood that contains electrolytes such as Na^+, Ca^{2+}, Mg^{2+}, HCO_3^-, Cl^-, etc, apart from water, protein, clotting factors and glucose. These ions acts as corroding medium for the implant material.

Balanced Salt Solutions (BSS): BSS are used, in combination with other agents, to treat damaging tissues and cells [5.30]. It contains isotonic salt concentration, mainly Na^+, K^+, Ca^{2+}, Mg^{2+} and Cl^-ions [5.31], and is made at physiological pH. It is also used to replace intraocular fluid during surgery.

Phosphate Buffered Solutions (PBS): The pH and ion concentration of PBS is similar to that of the human body i.e., it is isotonic with human body fluids. Also it is non-toxic to the cells. Hence it is used to clean cells and remove any disturbing agents.

In order to understand their reaction towards the bio-implant and to analyse their corrosive effects on implant material, the electrochemical tests must be performed in their presence i.e., by taking them as electrolyte. In present work, simulated body-fluids (SBFs) are used for electrochemical experiments, which are prepared in accordance with the salt concentration of original bio-fluids. Four SBFs, namely artificial saliva solution (ASS), phosphate-buffered saline solution (PBS), artificial blood plasma solution (ABP), and Hank's balanced saline solution (HBSS) were synthesized to perform potentiodynamic polarization studies on $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ and two Fe-based ($Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Fe_{67}Co_{18}B_{14}Si_1$) metallic glasses. The composition of all the SBFs have been discussed in chapter 2.

5.2 Results and Discussions

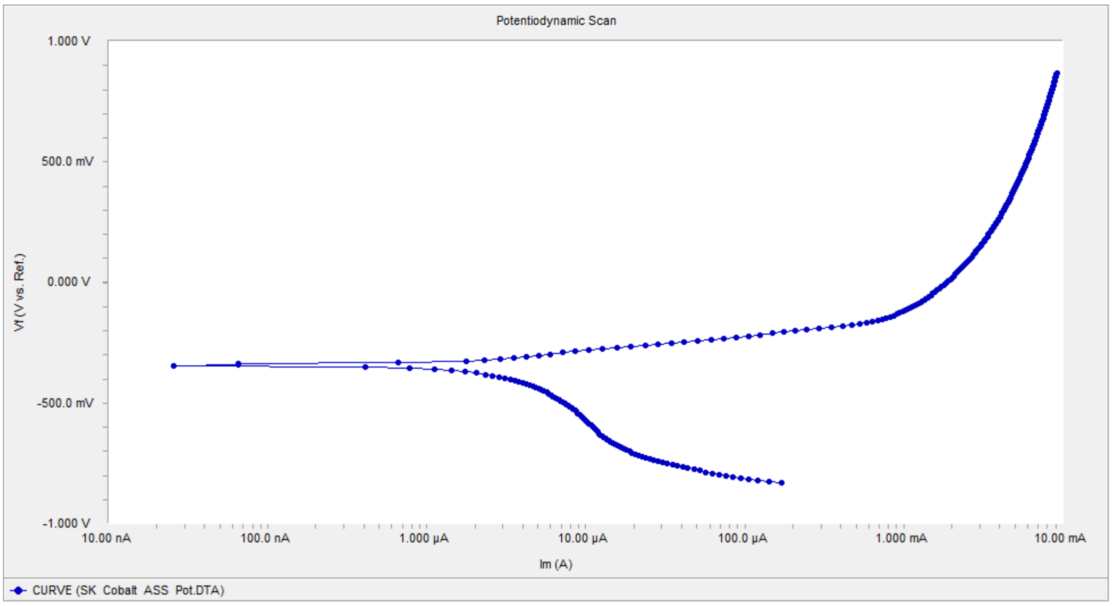
5.2.1 Bio-Corrosion Study of $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ Metallic Glass

Cobalt alloys are numbered among the main groups of metallic glasses that are used as bio-implants due to their good biocompatibility. Biocompatibility is connected with the corrosion and biological activity of the metallic glasses inside human body. In general, Co-based metallic glasses are highly corrosion resistant. Moreover they are less expensive than gold and other precious alloys. In present work, the bio-corrosion of $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass has been studied in four artificially synthesized body-fluids, in order to understand whether this material can be used as a bio material or not. The absence of carcinogenic elements such as Ni or Be, make it a potential candidate for the use in biomedical implants. Also this amorphous alloy is free from Cu or Al, which when used in large amount may hamper the bio-corrosion resistance of alloys by inducing biological toxicity [5.32].

The electrochemical reactions occurring in potentiodynamic tests involve movement of electrons from anode to cathode. This movement of electrons (current) may be due to oxidation or reduction that predominates at the alloy surface. i_{corr} and E_{corr} are the corrosion current and corrosion potential respectively. Oxidation results in anodic current and provides positive value of potential as compared to E_{corr}, whereas cathodic current results from reduction reaction with negative potential than E_{corr}. E_{corr} can be understood as the potential at which rate of oxidation and reduction are equal. In other words, E_{corr} represents the potential required to start an anodic polarization reaction and the corresponding current that marks the initiation of anodic polarization reaction is named as i_{corr}. Higher E_{corr} values indicate greater stability of the material in corrosive media and a high i_{corr} value represents high pace of dissolution. Passivation refers to the formation of passive film on the material due to which current remains almost same with increase in potential, thereby reducing the chemical reactivity of an alloy in the electrolyte. The current further increases when the passivating protective film begins to break.

The polarization curves of $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass specimen obtained in four different SBFs, exposed in air at room temperature, are shown in figure 5.1(a-d). The current values first decrease with increase in voltage during cathodic polarization, reaches the lowest value, and then start to increase again during anodic polarization. It can be observed that the current sharply increases with slight increase in anodic potential in all four electrolytes, and no passivation occurs during anodic polarization. The values of i_{corr} and E_{corr}, obtained by Tafel extrapolation, are reported in table 5.1.

(a)



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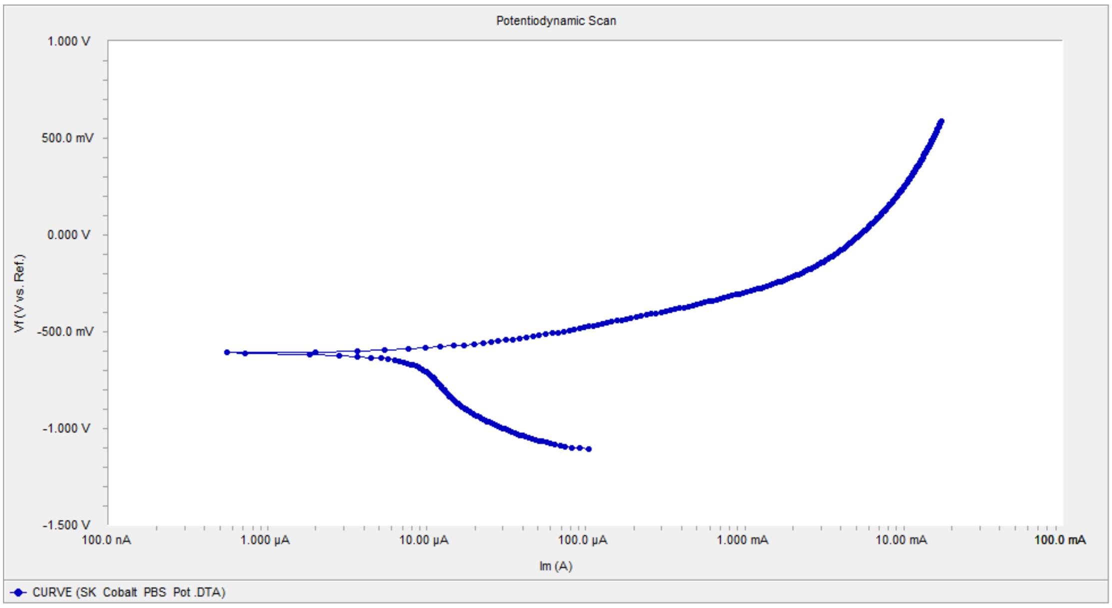
Potentiodynamic Scan
1.000 V
500.0 mV
0.000 V
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Vf (V vs. Ref.)
100.0 nA
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CURVE (SK Cobalt PBS Pot .DTA)

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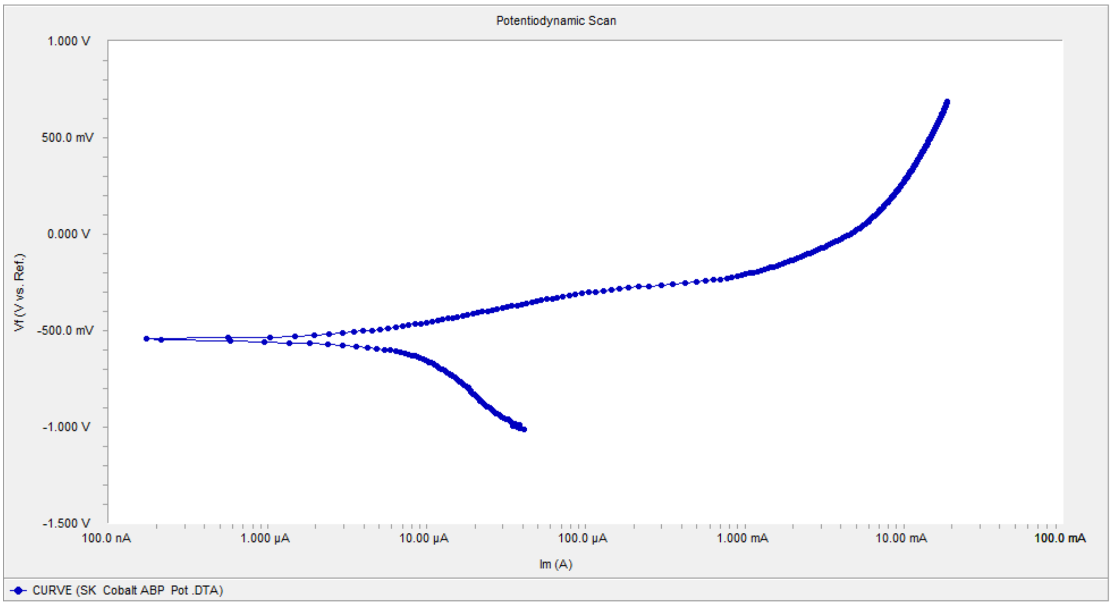
Potentiodynamic Scan
1.000 V
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-1.000 V
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(d)

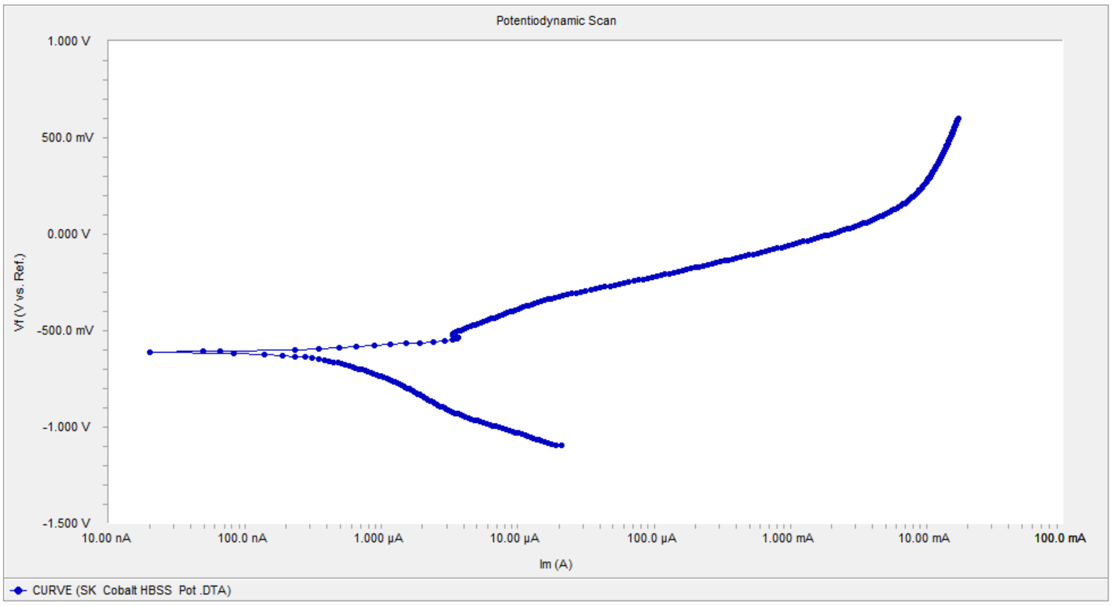


Fig. 5.1: Polarization curves for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glasses in: (a) artificial saliva solution (ASS) medium, (b) Phosphate-Buffered Saline (PBS) Solution, (c) Artificial Blood Plasma (ABP) Solution, and (d) Hank's Balanced Saline Solution (HBSS)

No significant passivation observed in any of the potentiodynamic scans for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass. The sudden increase in current after the E_{corr} value is attained, indicates the process of dissolution during anodic polarization. The anodic current values increase sharply in all the electrolytes, but this increase is highest in PBS solution. This indicates that the dissolution is highest in PBS solution compared to other electrolytes. Hence, highest corrosion rate is obtained in PBS solution i.e., 125.1 mpy. The corrosion rates in all for electrolytes are listed in table 5.1.

Table 5.1 Electrochemical parameters obtained of potentiodynamic study of $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass

Solutions	**i_{corr} (µA/cm^2)**	**E_{corr} (mV)**	**Corrosion Rate (mpy)**
ASS	0.816	-344.0	2.038
PBS	50	-610.0	125.1
ABP	10.24	-545.0	25.49
HBSS	4.32	-611.0	10.81

Low i_{corr} values indicate good corrosion resistance. The i_{corr} value for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass is two orders in magnitude greater than 316L SS and Ti-6Al-4V in PBS media [5.33]. Also the E_{corr} values for 316L SS and Ti-6Al-4V are -0.3V and -0.55V respectively, in PBS medium [5.33], whereas E_{corr} value for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass is -0.61 V. Hence its bio-corrosion resistance is lower than 316 L SS and Ti-6Al-4V. The E_{corr} values for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass in ASS and HBSS electrolytes are found to be of the same order, but slightly lower, as compared to the E_{corr} values for 316L SS and three Fe-based metallic glasses [5.34]. The i_{corr} value for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass (i_{corr} = 0.8 μA/cm^2) is also found to be comparable with 316 L SS (i_{corr} = 0.4 μA/cm^2) in HBSS solution [5.34]. Further, the E_{corr} values for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass (E_{corr} = -0.611V) is found to be greater than Ti-6Al-4V (E_{corr} = -0.639V) alloy, TiCuHfSi BMG (E_{corr} = -0.6324V), and pure Ti (E_{corr} = -0.642V) in HBSS solution [5.26]. Higher E_{corr} value indicates greater stability in bio-fluids. Therefore, $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass has a better stability than Ti-6Al-4V alloy, TiCuHfSi BMG and pure Ti. Also, $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass is found to have lower values of i_{corr} in HBSS medium as compared to Sr-Based BMGs, Ca-Based BMG, and conventional crystalline Mg and Mg alloys [5.35], and hence a better corrosion resistance.

In ASS medium, the E_{corr} values for Cu-Al, AISI 304, Co-Cr, and Low-Cu Amalgam are -0.36, -0.40, -0.385, and -0.505 V respectively [5.36], whereas for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass E_{corr} value is -0.344 V. Hence, $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass has a better stability in ASS medium as compared to Cu-Al, AISI 304, Co-Cr, and Low-Cu Amalgam. The corrosion rate is found to be lowest in ASS solution and highest in PBS solution among all four electrolytes. Hence it can be concluded that other solutions do less harm to the amorphous alloy than PBS. Due to this reason, we have analysed the surface of corroded $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass only in PBS medium. The surface of the metallic glass gets corroded due to the electrochemical reactions occurring on its surface. SEM images show the degraded sample surface as an effect of corrosion due to bio-fluids. The SEM micrographs of the corroded surface of $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass is shown in fig. 5.2, for PBS medium. It can be observed that PBS solution does not damage the surface of metallic glass much. Also no pits are formed due to corrosion. Rather, simple etching of the surface was observed as a result of electrochemical reactions taking place between the glassy alloy and the corroding media. This is the highest corroded surface morphology in all four bio-fluids. Other bio-fluids must be having less degrading effect on the metallic glass.

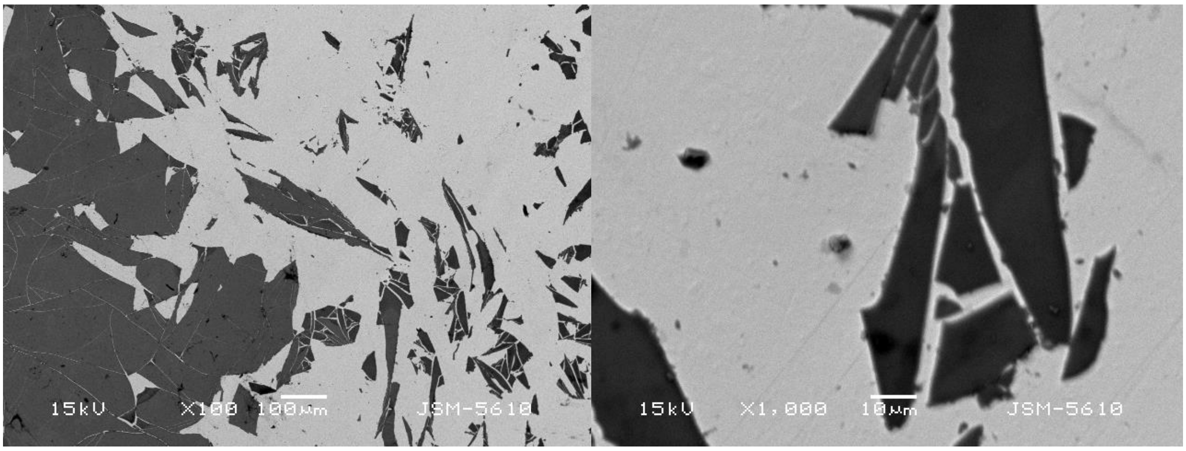


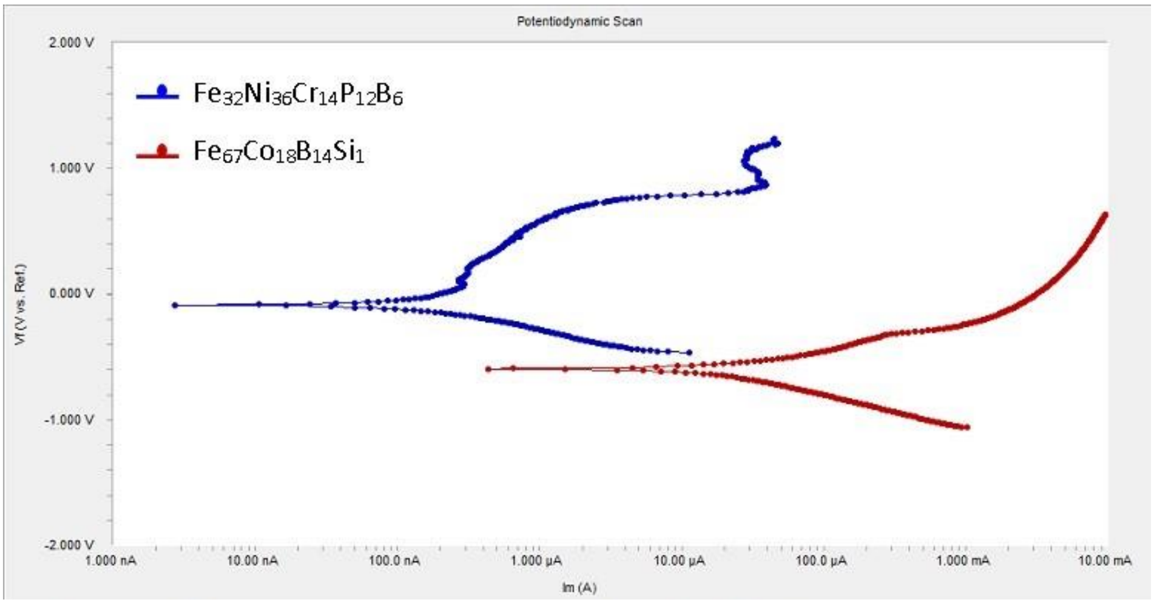
Fig. 5.2: SEM micrographs of corroded glass in PBS medium

5.2.2 Bio-Corrosion Study of Fe-based Metallic Glasses

The strength and poor susceptibility of Fe based metallic glasses toward highly corrosive media like HCl, NaCl, H_2SO_4, etc, makes them suitable candidate for engineering applications [5.37]. Fe-based metallic glasses also show good corrosion resistance even in bio-fluids [5.38], which makes them useful as bio-implants. In present work, the corrosion behaviour of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Fe_{67}Co_{18}B_{14}Si_1$ metallic glasses is studied through potentiodynamic polarization method under the influence of four SBFs.

Fig 5.3 (a-d) shows the polarization curve for both the metallic glasses in different SBFs. It can be seen that $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass exhibits small passivation in ASS and PBS media (fig 5.3(a, b)), whereas $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass does not passivate in any SBFs. Passivation refers to the stage during anodic polarization in which the current almost becomes constant with increasing potential, thereby resisting any further dissolution in the electrolyte.

(a)



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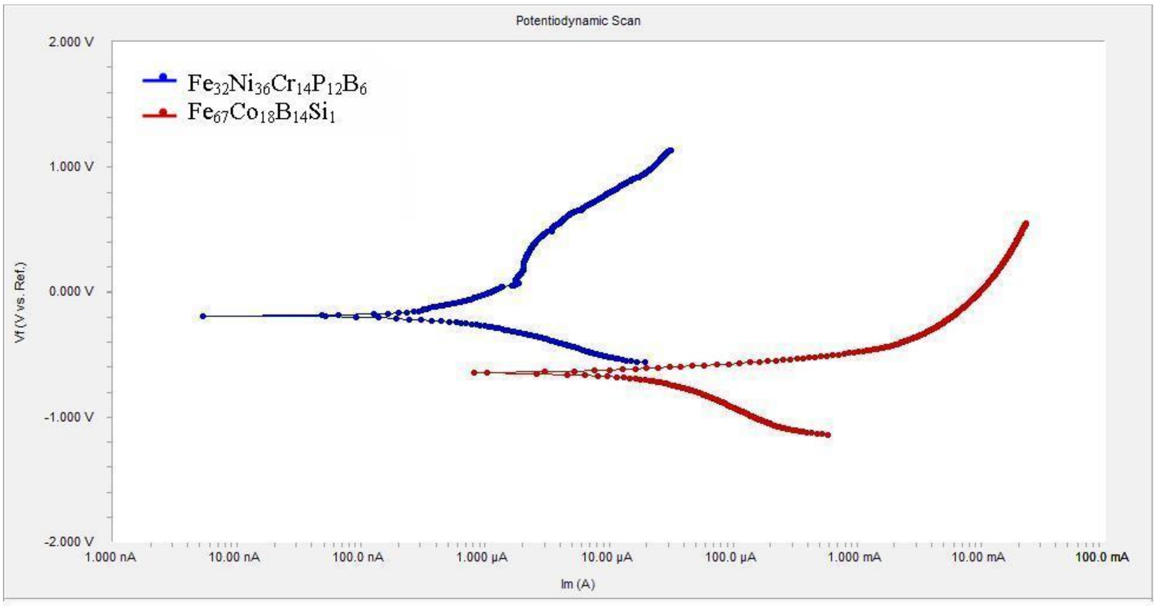

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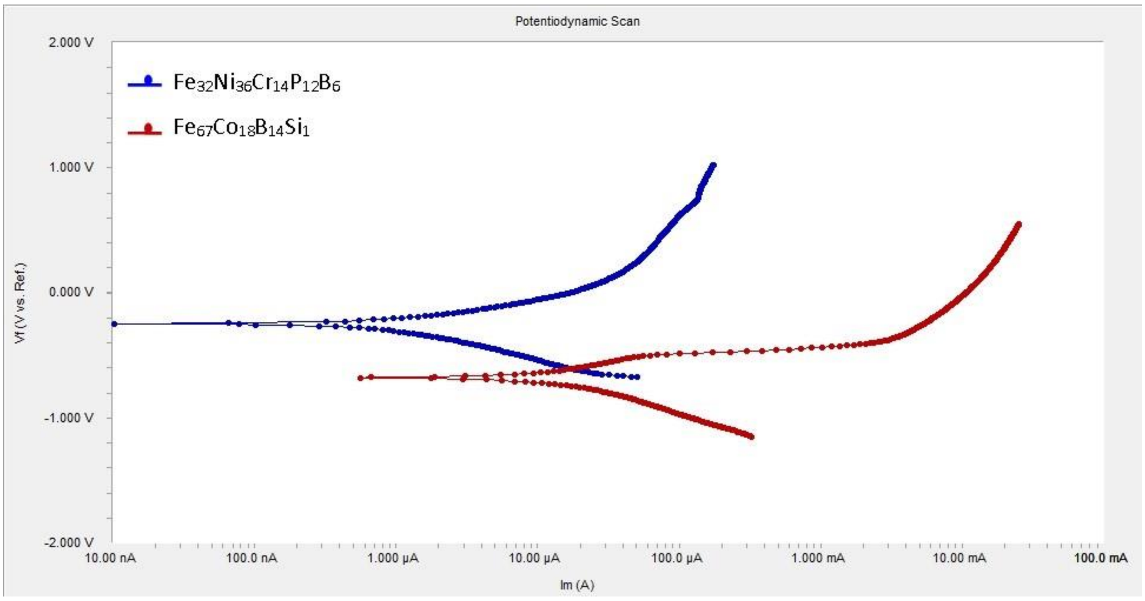

(d)

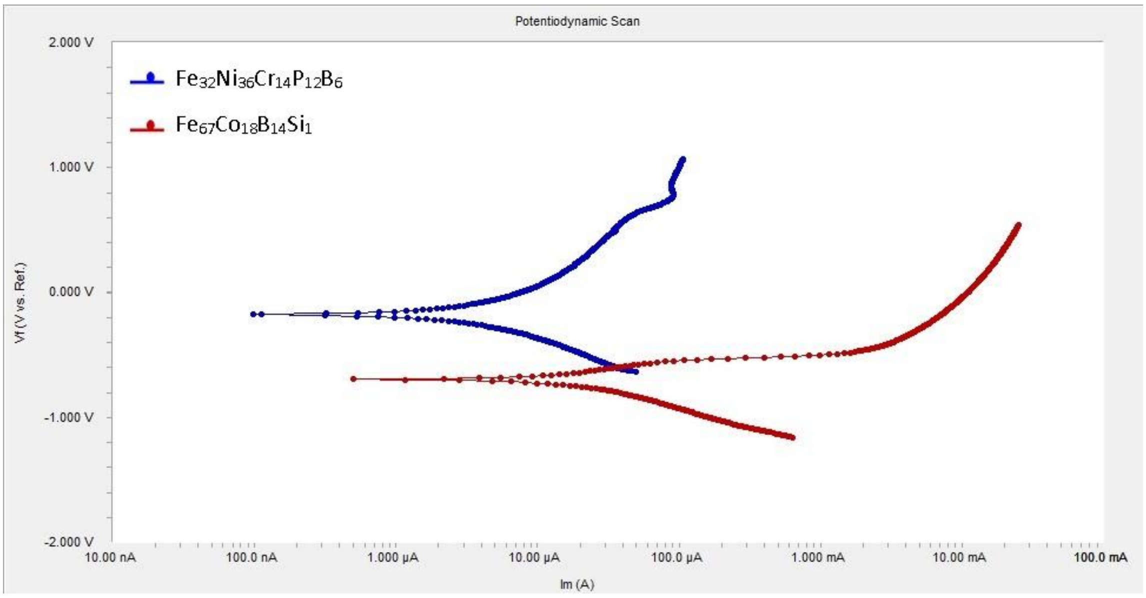

Fig. 5.3: Potentiodynamic scans of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Fe_{67}Co_{18}B_{14}Si_1$ metallic glasses in simulated bio-fluids: (a) ASS, (b) PBS, (c) ABP, and (d) HBSS

Table 5.2 reports the potentiodynamic parameters obtained by polarization experiments in different SBFs. The i_{corr} values for $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass is significantly lower than $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass in all SBFs (table 5.2). E_{corr} values are also found to be significantly higher for $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass as compared to $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass. Moreover, on comparing corrosion rates of both metallic glasses, it can be seen that $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass has lower rates of corrosion in all four SBFs as compared to $Fe_{67}Co_{18}B_{14}Si_1$ system. This implies that in comparison to $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass, $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass exhibits a greater stability in all four SBFs and poor susceptibility towards the dissolution process. Among all four SBFs, $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass shows highest corrosion rate in HBSS medium, whereas $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass shows highest corrosion rate in ABP medium. Fig 5.4 shows the SEM micrograph of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass in HBSS medium. It is evident from the fig 5.4 that the glass shows poor reaction towards the HBSS solution without much change in surface morphology. Whereas fig. 5.5 clearly indicates corroded surface of $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass in ABP medium.

Table 5.2 Electrochemical parameters obtained of potentiodynamic study of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Fe_{67}Co_{18}B_{14}Si_1$ metallic glasses

Sr. No	**Solutions**	**Sample**	**i_{corr} (μA/cm^2)**	**E_{corr} (mV)**	**Corrosion Rate**
1	ASS	$Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$	1.292	-88.10	0.484
		$Fe_{67}Co_{18}B_{14}Si_1$	51.2	-594.0	19.17
2	PBS	$Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$	1.428	-191.0	0.535
		$Fe_{67}Co_{18}B_{14}Si_1$	42.4	-647.0	15.97
3	ABP	$Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$	1.696	-247.0	0.635
		$Fe_{67}Co_{18}B_{14}Si_1$	92.8	-679.0	34.80
4	HBSS	$Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$	18.4	-176.0	6.902
		$Fe_{67}Co_{18}B_{14}Si_1$	62.0	-697.0	23.32

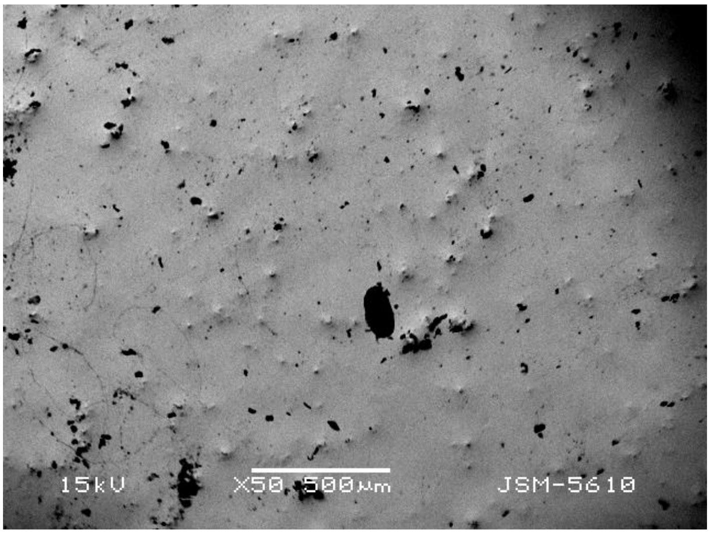

Fig. 5.4: SEM micrograph of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass in HBSS medium

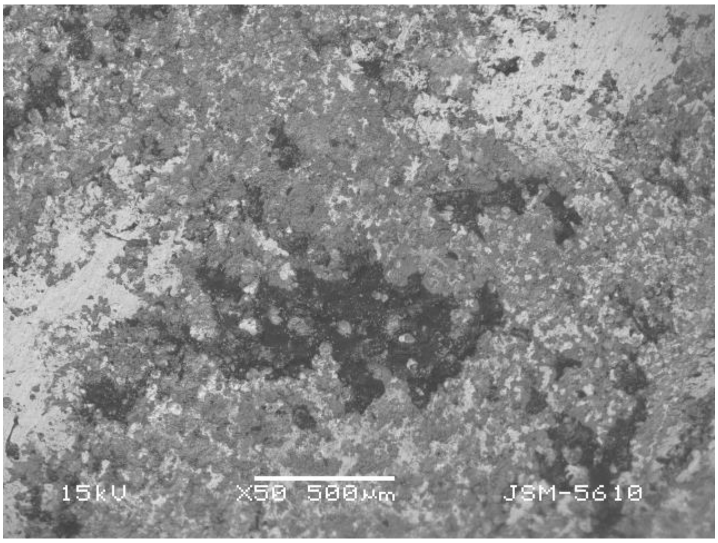

Fig. 5.5: SEM micrograph of $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass in ABP medium

Li et al [5.35] have fabricated a potential orthopaedic implant, $Sr_{40}Mg_{20}Zn_{15}Yb_{20}Cu_5$ bulk metallic glass (BMG), having high strength and biocompatibility. On comparing the i_{corr} values of Fe-based metallic glasses with $Sr_{40}Mg_{20}Zn_{15}Yb_{20}Cu_5$ BMG, Ca-based BMG and conventional crystalline Mg-alloys and pure Mg [5.35], it was found that $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass has the lowest i_{corr} value i.e., 18.4 μA/cm^2 (table 5.2). Hence it can be considered as a better biocompatible material as compared to Sr-based BMG. The E_{corr} values of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass in PBS medium (-0.19V) is found to be higher than the E_{corr} values for 316LSS (-0.30V), Ti-6Al-4V (-0.55V), and three Zr-based metallic glasses (-0.37V, -0.39V, and -0.42V) [5.33]. This implies that $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass has a better stability in PBS medium as compared to 316LSS, Ti-6Al-4V, and Zr-based metallic glasses.

Also the E_{corr} values for $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass is greater than the E_{corr} value of Cu-Al dental alloy (E_{corr}= -0.38V) in ASS medium [5.36]. Further, $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass is also found to have better stability, in terms of higher E_{corr} values, than Ti, Ti-6Al-4V, Ti-based BMG, 316 L SS and Fe-based amorphous alloys in Hank's and ASS [5.26, 5.34]. Hence $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass has a better stability in ASS, PBS, and Hank's solution. This therefore means that $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass can be used as an orthopaedic or dental implant material.

5.3 Conclusions

The bio-corrosion resistance of $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ and two Fe-based ($Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Fe_{67}Co_{18}B_{14}Si_1$) metallic glasses were studied in four SBFs. None of the polarization curves for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ and $Fe_{67}Co_{18}B_{14}Si_1$ metallic glasses expressed passivity. Whereas, the potentiodynamic polarization experiments indicated passive behaviour of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass in ASS and PBS media. As observed from the electrochemical parameters (E_{corr}, i_{corr} and corrosion rate) for Fe-based metallic glasses, $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ metallic glass was found to be better corrosion resistant than $Fe_{67}Co_{18}B_{14}Si_1$ metallic glass in all SBFs. In PBS medium $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass has lowest i_{corr} value as compared to both Fe-based metallic glasses. Hence it is more suitable for dental implant than Fe-based amorphous alloys.

The i_{corr} values for $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass were found to be greater than 316 L SS and Ti-6Al-4V, thereby indicating higher corrosion rates. It was found to be less stable in PBS solution as compared to 316 L SS and Ti-6Al-4V. But, $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glass has better corrosion resistance and greater stability, than Sr-based, Ca-based and conventional crystalline alloys in HBSS medium. Also, it has high stability in ASS medium as compared to Cu-Al, AISI 304, Co-Cr, and Low-Cu Amalgam. On comparing Co-based and Fe-based metallic glasses with other orthopaedic and dental alloys, available in literature, it was found that $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glasses are better biocompatible material as compared to Sr-based, Ca-based BMG, conventional crystalline Mg-alloys, pure Mg, Cu-Al dental alloy, etc. Hence, superior corrosion resistance of $Fe_{32}Ni_{36}Cr_{14}P_{12}B_6$ and $Co_{66}Si_{12}B_{16}Fe_4Mo_2$ metallic glasses under the influence of all four simulated body-fluids make them a potential candidate for orthopaedic and dental implants.

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