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Influence of polymer film concentration on cytocompatibility and corrosion suppression of ZM21 magnesium alloy

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Mg alloys are promising materials for biodegradable medical devices. However, control of Mg alloys corrosion is crucial for their success as implant devices. Application of biodegradable polymer film can improve initial cytocompatibility and corrosion resistance of Mg substrate.

In this work, effect of different biodegradable polymers and their concentrations on films properties were investigated in terms of cytocompatibility and corrosion protection. Poly-L-lactide(PLLA), poly(3-hydroxybutyrate)(PHB) and poly(3-hydroxybutyrate-co-3hydroxyvalerate)(PHBV) were utilized to prepare polymer films with concentration 1%(w/v) and 2%(w/v) on cast Mg-2.0Zn-0.98Mn (ZM21) magnesium alloy by spin-coating method. The main difference between polymers are molecular weight, crystallinity, hydrophobic moieties and degradation rate[1].

WST-1 results confirm SaOS-2 cell growth on PLLA, PHB and PHBV coated samples, however different polymer concentration is reflected in cells viability (Fig.1a). Films from 2% (w/v) concentration indicate higher cell growth than those with 1%(w/v). After 7d of incubation, PHBV 2% tended to be the most beneficial in cell growth improvement, and following are PHB 2%(w/v) and PLLA 2%(w/v). PLLA 1%(w/v) has the lowest contribution in cell growth. Mg^{2+} ion release was observed for all samples and increased along incubation period (Fig.1b). Slightly difference between PLLA and PHAs (polyhydroxyalkanoates: PHB and PHBV) was noticed at 7d, indicating PHAs as more beneficial in suppression of Mg^{2+} release. Obtained results can be related to slightly thicker 2%(w/v) films and polymer physicochemical properties itself.

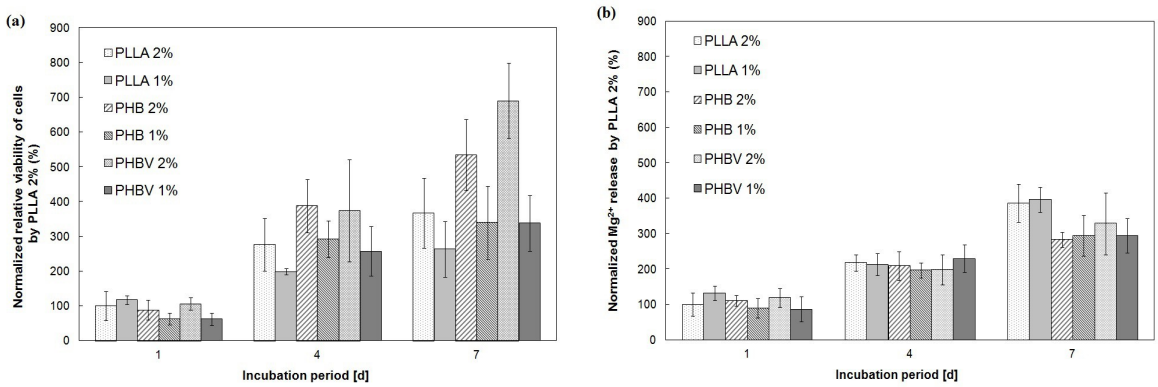

Fig.1 (a) Normalized data by PLLA 2%(1d) for polymer coated samples, (b) relative viability of cells Mg^{2+} ions release.

[1] A. Witecka, A. Yamamoto, J. Idaszek, A. Chlanda, W. Święszkowski (2016), Colloids Surf. B 144: 284-292