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Fig.1s Schematic representation of reaction formula of PVA with H₃BO₃

$$(a) \\ HO \longrightarrow OH + H_4BO_4^- \longrightarrow HO \longrightarrow OH + 4H_2O \\ Glyceroborate [BG_2] \\ HO \longrightarrow OH + WWY \longrightarrow OH OH \\ (b) \\ (b)$$

Fig.2s Schematic representation of reaction formula of PVA/glycerol with H₃BO₃

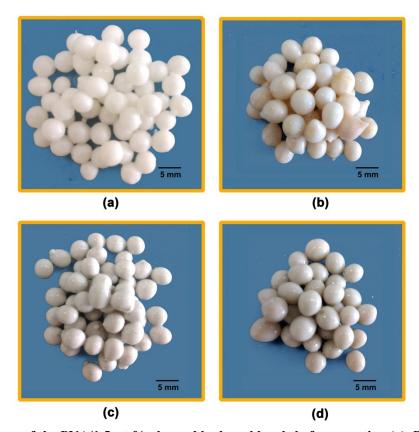


Fig.3s The image of the PVA/1.5 wt % glycerol hydrogel beads before aeration (a), PVA/1.5 wt % glycerol hydrogel beads after aeration for 22 months (b), PVA/1.5 wt % glycerol hydrogel beads immobilized with microorganism before aeration (c) and PVA/1.5 wt % glycerol hydrogel beads immobilized with microorganism after aeration for 11 months (d)