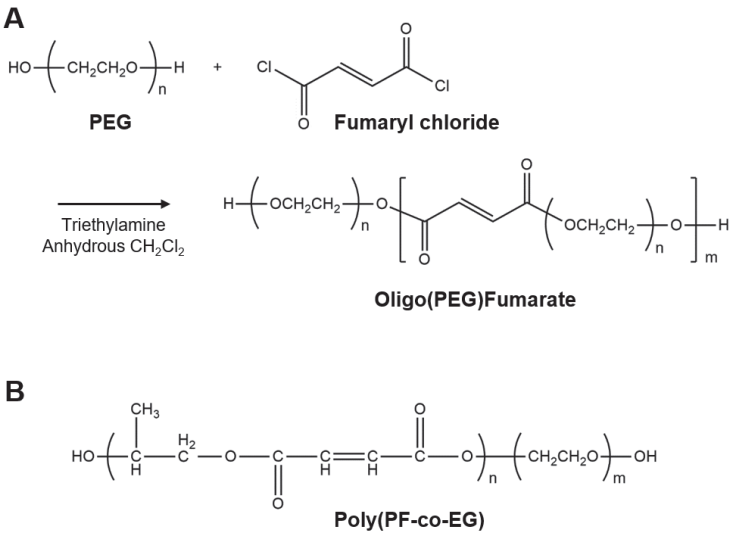

Fig. 5. Photocurable poly(propylene fumarate)-based polymers (A) Oligo(propylene fumarate-co-ethylene glycol) (B) Poly(propylene fumarate-co-ethylene glycol).

of the poly(ethylene glycol) (PEG) chains (Suggs et al. 1998a; Suggs et al. 1998b; Tanahashi et al. 2002). Poly(PF-co-EG) can be obtained through the reaction of fumaryl chloride and triethylamine as seen in Fig. 5. Purified PEG was first dissolved in dichloromethane, and fumaryl chloride and triethylamine (TEA) were added drop-wise over several hours while the reaction flask was maintained near 0°C. The reaction further proceeded for 1–2 days at room temperature. As propylene fumarate has linear unsaturated double bonds, poly(PF-co-EG) undergoes photocrosslinking (Timmer et al. 2003). Photocrosslinking poly(PF-co-EG) containing cell adhesion peptides (RGD) and growth factors (TGF-β) were explored for use of injectable drug delivery systems and tissue engineering (Kallukalam et al. 2009; Shung et al. 2003).

Poly(vinyl alcohol)-based photocurable hydrogels

Poly(vinyl alcohol) (PVA) is a water soluble synthetic polymer with pendant hydroxyl groups, which is a hydrolysed product from poly(vinyl acetate). It is biocompatible and possesses antifouling property against proteins and cells (Murosaki et al. 2011). PVA can be modified for photopolymerization through the reaction of pendant hydroxyl groups with acrylic acid, methacrylic acid, glycidyl acrylate, and 2-isocyanotoethyl methacrylate (ICEMA) (Andrews et al. 2012; Bourke et al. 2003; Bryant et al. 2004; Ichimura and Komatsu 1987; Ichimura and Watanabe 1982; Muhlebach et al. 1997; Nuttelman et al. 2002; Schmedlen et al. 2002). The mechanical properties of photocurable poly(vinyl alcohol) hydrogels can be controlled by their concentration and the number of crosslinking groups per chain. Some representative PVA derivatives are shown in Fig. 6. ‘Figure 6 photocurable poly(vinyl alcohol)-based polymers’. Anseth group developed photocurable biodegradable poly(vinyl alcohol) for tissue engineering