adherence to the tissue when applied to a wound. The device of the present invention further shows improved swelling behavior, i.e. low swelling, after application to a wound.

[0010] A further aspect relates to a method of manufacturing such sponges or devices.

[0011] The invention includes hemostatic devices manufactured in accordance with the present invention. In one aspect, a method of manufacturing a hemostatic device can be provided. The method can include:

providing a porous sponge of a matrix of a biomaterial;

providing a polymeric material in the form of a suspension, solution, or powder;

combining the polymeric material with a solvent;

contacting the combination of the polymeric material and the solvent with at least one surface of the biomaterial matrix, wherein the contacting is by spraying or printing and the polymeric material is a single type of reactive polyethylene glycol;

removing the solvent; and

retaining a coating of the polymeric material on the biomaterial matrix;

wherein the method is carried out in the absence of thermal processing.

[0011A] In one aspect, a hemostatic device, which can include comprising a biomaterial matrix and a polymeric material, can be provided. The polymeric material can be stably associated with the biomaterial matrix through the steps of:

combining the polymeric material with a solvent;

applying the polymeric material and the solvent to the biomaterial matrix by spraying or printing, wherein the polymeric material is a single type of reactive polyethylene glycol; and

subsequently removing the solvent;

wherein the polymeric material is stably associated with the biomaterial matrix in the absence of thermal processing.

[0012] In one aspect, embodiments of the present invention encompass a hemostatic pad. Exemplary pads may include a matrix of a biomaterial and one hydrophilic polymeric component having reactive groups. The biomaterial and polymeric component can be associated with each other so that the reactivity of the polymeric component is retained. The biomaterial and polymeric component can be associated so that the polymeric component is coated onto a surface of said matrix of a biomaterial, or so that the matrix is impregnated with the polymeric material, or both. The polymeric material is combined with a solvent and may be sprayed or printed on the surface of biomaterial. The solvent is then removed, leaving the biomaterial coated with the polymeric material. The biomaterial can include collagen, gelatin, fibrin, a polysaccharide, e.g. chitosan, a synthetic biodegradable biomaterial, e.g. polylactic acid or polyglycolic acid, and derivatives thereof. The hydrophilic polymer can be a polyalkylene oxide polymer, esp. preferred a PEG comprising polymer, e.g. a multi-electrophilic polyalkylene oxide polymer, e.g. a multi-electrophilic PEG, such as pentaerythritolpoly(ethyleneglycol)ether tetrasuccinimidyl glutarate. In some cases, the biomaterial can be collagen and the polymeric component can be pentaerythritolpoly(ethyleneglycol)ether tetrasuccinimidyl glutarate. The polymeric form can be coated onto the collagen. In some cases, the biomaterial is collagen and the polymeric component is pentaerythritolpoly(ethyleneglycol)ether tetrasuccinimidyl glutarate, and the polymeric form is impregnated into the collagen.

[0013] In an embodiment, the biomaterial is coated with PEG or a derivative thereof. The PEG is combined with a non-reactive solvent with a low boiling point to dissolve the PEG and then the solvent and PEG combination is sprayed or printed on the surface of the matrix in a uniform or patterned coating. The solvent is then removed, leaving behind the PEG layer. In an embodiment, the solvent is removed through low pressure or low temperature evaporation.

[0014] In an embodiment, no thermal processing is needed in the manufacture of the device.