comprising buprenorphine blended with ethylene vinyl acetate (EVA copolymer). Patel et al. U.S. Patent Application Publication No. 2005/0031668 describes an implantable polymeric device for sustained release of nalmefene. Patel et al. U.S. Patent Application Publication No. 2005/0031667 describes an implantable polymeric device for sustained release of dopamine agonists. Additional drug delivery devices include stents coated with compositions comprising drugs. Various devices and coatings are described in U.S. Patent No. 6,506,437 to Harish; U.S. Patent No. 7,364,748 to Claude and U.S. Patent No. 7,384,660 to Hossainy. U.S. Patent No. 3,625,214 describes a drug-delivery device for prolonged drug delivery, fabricated in a spiral or "jellyroll" fashion. U.S. Patent No. 3,926,188 describes a three-layer laminate drug dispenser comprising a core lamina of a crystalline drug of low water solubility dispersed in a polymer matrix, interposed between outer laminas made of a drug release rate controlling polymer. U.S. Patent No. 5,683,719 describes a controlled release composition comprising an extruded core of active material and excipients, the core being coated in a water insoluble coating.

[0006] Implantable devices are inserted subcutaneously in areas of the body, and may be subject to physical damage. Kleppner et al. 2006 J. Pharm. Pharmacol. 58:295-302 described breakage of devices within the bodies of treated dogs. Implantable devices comprising EVA (ethyl vinyl acetate copolymer) and buprenorphine (for treatment of opioid dependence) were inserted subcutaneously in the backs of test dogs. 70% of the implants had broken within 10 months. Drug delivery was estimated to increase by 5% in implants that broke into two pieces, and 10% in implants that broke into three pieces. Thus, breakage of implantable devices would interfere with the regulated dosing and delivery of drug substances. Breakage of the implantable devices may also result in jagged device edges which could cause tissue damage and pain to the patient. Finally, breakage of the implantable devices seriously complicates removal of the device, as it may be difficult to extract the broken pieces without causing damage to the surrounding tissue.

[0007] There is a need for implantable devices which are not subject to breakage within the body of the patient.

BRIEF SUMMARY OF THE INVENTION

[0007a] According to an aspect, there is provided an implantable device for delivery of a pharmaceutical substance to a patient, comprising:a rod-shaped core comprising a core polymeric material that does not have a pharmaceutical substance, and wherein the core polymeric material is ethylene vinyl acetate (EVA); a first layer comprising a first-layer

pharmaceutical substance and a first-layer polymeric material surrounding the core; and one or more additional layers comprising an additional pharmaceutical substance and an additional polymeric material, where the core polymeric material, first-layer polymeric material and one or more additional polymeric materials are the same or different, where the first-layer pharmaceutical substance, and one or more additional pharmaceutical substances are the same or different, and wherein the outermost layer of the device comprises the additional pharmaceutical substance.

[0008] Embodiments of the present invention provide implantable drug delivery devices of heterogeneous composition. Various embodiments of the devices can provide enhanced mechanical strength and/or advantageous drug delivery properties.

CLAIMS:

1. An implantable device for delivery of a pharmaceutical substance to a patient, comprising:

a rod-shaped core comprising a core polymeric material that does not have a pharmaceutical substance, and wherein the core polymeric material is ethylene vinyl acetate (EVA);

a first layer comprising a first-layer pharmaceutical substance and a first-layer polymeric material surrounding the core; and

one or more additional layers comprising an additional pharmaceutical substance and an additional polymeric material, where the core polymeric material, first-layer polymeric material and one or more additional polymeric materials are the same or different, where the first-layer pharmaceutical substance, and one or more additional pharmaceutical substances are the same or different, and wherein the outermost layer of the device comprises the additional pharmaceutical substance.

2. The device of claim 1, wherein the first-layer polymeric material is EVA.

3. The device of claim 1, wherein at least one of the core polymeric material, first-layer polymeric material, and one or more additional polymeric materials is different from the other materials.

4. The device of claim 1, wherein at least one of the first-layer polymeric material and one or more additional polymeric materials is bioerodible, with the proviso that no bioerodible layer is located within a non-bioerodible layer.

5. The device of claim 1, wherein at least one of the first-layer polymeric material and one or more additional polymeric materials is non-bioerodible, with the proviso that no bioerodible layer is located within a non-bioerodible layer.

6. The device of claim 5, wherein the first-layer polymeric material and additional polymeric materials are EVA.