Claims

1. A stopper for a syringe assembly, the stopper comprising a thermoplastic elastomer, wherein an outer surface of the stopper is non-lubricated, wherein the viscosity of the thermoplastic elastomer at 205 degrees C is ≥70.0 Pa·s at 1,000 s^{-1} shear rate, ≥12.0 Pa·s at 10,000 s^{-1} shear rate, and ≥3.0 Pa·s at 50,000 s^{-1} shear rate.

2. The stopper of claim 1, wherein the compression set of the thermoplastic elastomer is ≤ 50% when measured at 25% compression for 22 hrs at 70 degrees C.

3. The stopper of claim 1, wherein the hardness of the thermoplastic elastomer is approximately 40-70 Shore A.

4. A stopper for a syringe assembly, the stopper comprising an elastomeric body, wherein the compression set of the elastomeric body is ≤ 50% when measured at 25% compression for 22 hours at 70 degrees C, wherein the hardness of the elastomeric body is 40-70 Shore A, wherein the viscosity of the elastomeric body at 205 degrees C is ≥ 115 Pa·s at 1,000 s^{-1} shear rate, ≥ 25 Pa·s at 10,000 s^{-1} shear rate, and ≥ 5 Pa·s at 50,000 s^{-1} shear rate, and wherein the elastomeric body comprises at least an olefin block copolymer.

5. The stopper of claim 4, wherein the compression set of the elastomeric body is ≤ 45% when measured at 25% compression for 22 hours at 70 degrees C.

6. The stopper of claim 4, wherein the compression set of the elastomeric body is 35% - 45% when measured at 25% compression for 22 hours at 70 degrees C.

7. The stopper of claim 4, wherein the hardness of the elastomeric body is 51-61 Shore A.

8. The stopper of claim 4, wherein the viscosity of the elastomeric body is 115 - 210 Pa·s at 1,000 s^{-1} shear rate.

9. The stopper of claim 4, wherein the viscosity of the elastomeric body is 165 Pa·s at 1,000 s^{-1} shear rate.

10. The stopper of claim 4, wherein the viscosity of the elastomeric body is 25-35 Pa·s at 10,000 s^{-1} shear rate.

11. The stopper of claim 4, wherein the viscosity of the elastomeric body is 30 Pa·s at 10,000 s^{-1} shear rate.

12. The stopper of claim 4, wherein the viscosity of the elastomeric body is 5-9 Pa·s at 50,000 s^{-1} shear rate.

13. The stopper of claim 4, wherein the viscosity of the elastomeric body is 7 Pa·s at 50,000 s^{-1} shear rate.

14. A stopper for a syringe assembly, the stopper comprising an elastomeric body, wherein the compression set of the elastomeric body is $\leq$ 45% when measured at 25% compression for 22 hours at 70 degrees C, wherein the hardness of the elastomeric body is 40-70 Shore A, and wherein the viscosity of the elastomeric body at 205 degrees C is $\geq$ 115 Pa·s at 1,000 s^{-1} shear rate, $\geq$ 25 Pa·s at 10,000 s^{-1} shear rate, and $\geq$ 5 Pa·s at 50,000 s^{-1} shear rate.

15. The stopper of claim 14, wherein the compression set of the elastomeric body is 35% - 45% when measured at 25% compression for 22 hours at 70 degrees C.

16. The stopper of claim 14, wherein the viscosity of the elastomeric body is 115 - 210 Pa·s at 1,000 s^{-1} shear rate.

17. The stopper of claim 14, wherein the viscosity of the elastomeric body is 165 Pa·s at 1,000 s^{-1} shear rate.

18. The stopper of claim 14, wherein the viscosity of the elastomeric body is 25-35 Pa·s at 10,000 s^{-1} shear rate.

19. The stopper of claim 14, wherein the viscosity of the elastomeric body is 30 Pa·s at 10,000 s^{-1} shear rate.

20. The stopper of claim 14, wherein the viscosity of the elastomeric body is 5-9 Pa.s at 50,000 s^{-1} shear rate.

21. The stopper of claim 14, wherein the viscosity of the elastomeric body is 7 Pa·s at 50,000 s^{-1} shear rate.

22. A syringe assembly, comprising:

a syringe barrel having a proximal end, a distal end, and a sidewall extending therebetween and defining a chamber having an interior;

a stopper disposed within the interior of the syringe barrel, the stopper comprising an elastomeric body, wherein the compression set of the elastomeric body is ≤ 50% when measured at 25% compression for 22 hours at 70 degrees C, wherein the viscosity of the elastomeric body at 205 degrees C is ≥ 115 Pa·s at 1,000 s^{-1} shear rate, ≥ 25 Pa·s at 10,000 s^{-1} shear rate, and ≥ 5 Pa·s at 50,000 s^{-1} shear rate, and wherein the elastomeric body comprises at least an olefin block copolymer; and

a plunger rod having a first end engageable with a portion of the stopper.

23. The syringe assembly of claim 22, wherein the compression set of the elastomeric body is ≤ 45% when measured at 25% compression for 22 hours at 70 degrees C.

24. The syringe assembly of claim 22, wherein the compression set of the elastomeric body is 35% - 45% when measured at 25% compression for 22 hours at 70 degrees C.

25. The syringe assembly of claim 22, wherein the hardness of the elastomeric body is 51-61 Shore A.

26. The syringe assembly of claim 22, wherein the viscosity of the elastomeric body is 115 - 210 Pa·s at 1,000 s^{-1} shear rate.

27. The syringe assembly of claim 22, wherein the viscosity of the elastomeric body is 165 Pa·s at 1,000 s^{-1} shear rate.

28. The syringe assembly of claim 22, wherein the viscosity of the elastomeric body is 25-35 Pa·s at 10,000 s^{-1} shear rate.

29. The syringe assembly of claim 22, wherein the viscosity of the elastomeric body is 30 Pa·s at 10,000 s^{-1} shear rate.

30. The syringe assembly of claim 22, wherein the viscosity of the elastomeric body is 5-9 Pa·s at 50,000 s^{-1} shear rate.

31. The syringe assembly of claim 22, wherein the viscosity of the elastomeric body is 7 Pa·s at 50,000 s^{-1} shear rate.

32. A stopper for a syringe assembly, the stopper comprising an upper portion, a lower portion, and a middle portion extending between the upper portion and the lower portion, the upper portion, the lower portion, and the middle portion defining an interior cavity, wherein at least one arm element is provided within the interior cavity in the upper portion of the stopper, the stopper further comprising an elastomeric body, wherein the compression set of the elastomeric body is $\leq$ 45% when measured at 25% compression for 22 hours at 70 degrees C,

wherein the viscosity of the elastomeric body at 205 degrees C is ≥ 115 Pa·s at 1,000 s^{-1} shear rate, ≥ 25 Pa·s at 10,000 s^{-1} shear rate, and ≥ 5 Pa·s at 50,000 s^{-1} shear rate, and wherein the elastomeric body comprises at least an olefin block copolymer.