CLAIMS

1. A method of controlling the data bit rate of data stored on a polymer passing through a nanopore in a nanopore-based memory device, comprising:
   receiving a reference mean bit rate;
   receiving data bits read from the data stored on the polymer and determining a real-time instantaneous bit rate;
   calculating an actual mean bit rate based on the instantaneous bit rate;
   calculating a bit rate difference between the reference mean bit rate and the actual mean bit rate; and
   dynamically controlling a steering voltage which controls the data bit rate of data stored on the polymer passing through the nanopore, such that the actual mean bit rate is maintained substantially at the reference mean bit rate.

2. The method of claim 1, wherein the controlling the steering voltage is performed by dynamic control logic.

3. The method of any foregoing claim, wherein the dynamic control logic comprises at least one of: a proportional-integral (P-I), proportional, proportional-integral-derivative (P-I-D), low pass (LP), high pass (HP), bandpass (BP), quadratic (2nd order), linear, non-linear, lead/lag, and multi-order control.

4. The method of any foregoing claim wherein the steering voltage creates an electric field which is proportional to velocity of the polymer passing through the nanopore.

5. The method of any foregoing claim wherein data is stored in a nanopore polymer memory device, the device having an add “0” chamber, an add “1” chamber, and a “deblock” chamber.

6. The method of any foregoing claim wherein the reference mean bit rate is set to a first value when the device is reading data and set to a second value when the device is writing data.

7. The method of any foregoing claim wherein reference bit rate for reading data or writing data changes based on where along the polymer memory string the data is located when being read or written.

8. The method of any foregoing claim wherein reference bit rate for reading data or writing data changes based on the digital data pattern stored on the polymer as it passes through the nanopore.

9. A method of storing and reading digital data, comprises:

providing a nanopore polymer memory device having at least one memory cell comprising at least two addition chambers each arranged to add a unique chemical construct (or codes) to a polymer (or DNA) string when the polymer enters the respective addition chamber, the data comprising a series of the codes;

successively steering the polymer at a bit rate through the nanopore into the addition chambers to add the codes to the polymer to create the digital data pattern on the polymer; and

accurately controlling the bit rate of the polymer using a servo controller.

10. The method of claim 9 further comprising steering the polymer through the nanopore at a read bit rate to read the codes on the polymer and wherein the controller controls the read bit rate of the polymer when reading the codes stored on the polymer.

11. The method of claim 9 or 10, wherein the controller comprises dynamic control logic comprises at least one of: a proportional-integral (P-I), proportional, proportional-integral-derivative (P-I-D), low pass (LP), high pass (HP), bandpass (BP), quadratic (2nd order), linear, non-linear, lead/lag, and multi-order control.

12. The method of any of claims 9 through 11 wherein the device comprises a plurality of memory cells and the servo controller controls the bit rate for each of the memory cells independently.

13. A method of storing and retrieving data using a polymer, comprising:
storing data in a nanopore polymer memory device, the device having an add “0” chamber, an add “1” chamber, and a “deblock” chamber, and the data being encoded as part of the storing process as raw stored data;
retrieving the raw stored data from the nanopore memory cell; and
processing the raw data to provide clean data for use by a user device.

14. The method of claim 13 further comprising receiving the clean data by the user device.

15. The method of claim 13 or 14 wherein the use comprises at least one of accessing, reading, using, and storing the clean data.

16. The method of claim 13, 14, or 15 wherein the device comprises electrodes for moving the polymer between the chambers.

17. The method of any of claims 13 through 16 wherein the processing the raw data comprises performing at least one of: error correction, special bit removal, decoding, decryption, and decompression.

18. The method of any of claims 13 through 17 further comprising requesting the raw data or clean data be retrieved.

19. A method for loading a polymer into a nanopore-based device, comprising:
providing at least one memory cell, each cell having at least two add chambers each of the add chambers having a nanopore arranged to allow the polymer to enter and exit the add chamber from an adjacent deblock chamber, and each of the add chambers arranged to add a unique code to the polymer when the polymer enters the respective add chamber, the deblock chamber arranged to enable the polymer to receive the code when the polymer enters the

respective add chamber and the deblock chamber having at least one loading hole in a side opposite from the nanopore;

providing a loading chamber, fluidically connected to the deblock chamber via the at least one loading hole;

loading the loading chamber with a loading fluid having the polymer; and

loading the polymer from the loading chamber through the loading hole into the deblock chamber; and

sealing the loading hole.

20. The method of claim 19 further comprising removing the loading fluid from the loading chamber.