current density and subsequent heating effects. It is also known that polyacrylamide will spontaneously adhere to metal and form a partial film [46], this partial film will result in higher current densities through the non-coated Pt surface relative to an pristine surface and a mildly higher surface coverage appears to arise for higher molecular weight samples [46]. This affinity for coating electrodes requires careful cleaning between runs [56], while a dependence of coverage on molecular weight could account for no observed globules arising in the LMW samples for voltages observed to give rise to globules in the HMW samples. Spontaneous coating of electrodes is a rapid effect [46], on the order of 10's of seconds, and experimental setup times ensure that the coating process is complete before experiments commence.

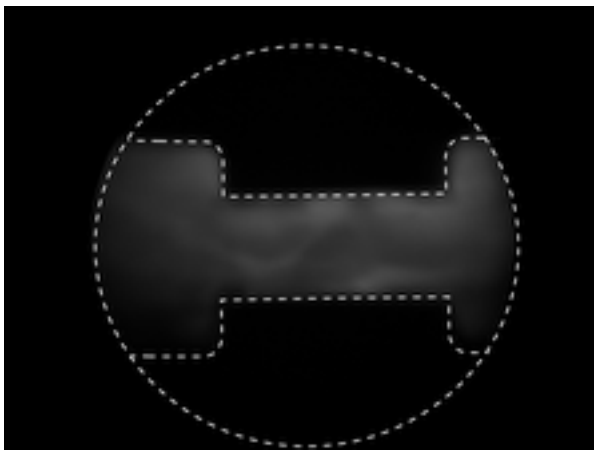

FIG. 8: Globule formation. Globules are formed at larger applied voltages ($\geq$0.5 kV). Seen here are globules formed at 1 kV potential for a 120 ppm HMW sample. It was found that at larger applied voltages globules would form in the fluid with dimensions on the order of the channel, presumably due to cross linking of PAAm at the electrodes. While this effect may be of interest in making microgels [47] on demand in microfluidics it is not explored further here.

## V. CONCLUSION

In summary, extensional instabilities are excited in polymer solutions electro-osmoticaly pumped through a 2:1 microchannel constriction. Polymer-free solutions display creeping laminar flow, while addition of high molecular weight polymer leads to instabilities above a critical flow rate corresponding to the viscoelastic instability condition for extensional