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Diffusion of oligonucleotides from within Iron-Cross-Linked, Polyelectrolyte-Modified Alginate Beads: A Model System for Drug Release. SERGII DOMANSKYI, VLADIMIR PRIVMAN, Department of Physics, Clarkson University, ROBERTO LUZ, NATALIIA GUZ, Department of Chemistry and Biomolecular Science, Clarkson University, LAWRENCE GLASSER, Department of Physics, Clarkson University, EVGENY KATZ, Department of Chemistry and Biomolecular Science, Clarkson University — An analytical model to describe diffusion of oligonucleotides from stable hydrogel beads is developed and experimentally verified. The synthesized alginate beads are Fe3+-cross-linked and polyelectrolyte-doped for uniformity and stability at physiological pH. Data on diffusion of oligonucleotides from inside the beads provide physical insights into the volume nature of the immobilization of a fraction of oligonucleotides due to polyelectrolyte cross-linking, that is, the absence of a surface layer barrier in this case. Furthermore, the results suggest a new simple approach to measuring the diffusion coefficient of mobile oligonucleotide molecules inside hydrogels. The considered alginate beads provide a model for a well-defined component in drug-release systems and for the oligonucleotide-release transduction steps in drug-delivering and biocomputing applications. This is illustrated by destabilizing the beads with citrate, which induces full oligonucleotide release with nondiffusional kinetics.

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