LARGE TIME BEHAVIOR OF A SOLUTION TO A FREE BOUNDARY PROBLEM DESCRIBING MIGRATION INTO RUBBERS WITH A BREAKING EFFECT

Dedicated to Professor Nobuyuki Kenmochi on the occasion of his 77th birthday

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Abstract. We prove the existence and uniqueness of a globally-in-time solution to a one-dimensional free boundary problem describing the migration of diffusants into rubber. In our setting, the free boundary represents the position of the front of the diffusant region. The growth rate of the diffusant region is described by an ordinary differential equation that includes the effect of breaking its growth. The key to global existence is that the free boundary is strictly greater than 0. Using this result we use the extending argument of local solutions.

Additionally, we investigate the large time behavior of a solution to the problem. The main contents for this paper are the global boundedness and a uniform energy estimate of the solution. By using these estimates, we show that the solution converges to some finite constant as time goes to infinity.