A numerical semigroup $S$ is a cofinite, additively-closed subset of the nonnegative integers that contains 0. In this paper, we initiate the study of atomic density, an asymptotic measure of the proportion of irreducible elements in a given ring or semigroup, for semigroup algebras. For a fixed field $F$ and a numerical semigroup $S$, the numerical semigroup algebra $F[S]$ is the subring of $F[x]$ consisting only of terms of the form $x^a$ for $a \in S$.

It is known that the atomic density of the polynomial ring $F_q[x]$ is zero for any finite field $F_q$. We prove that the numerical semigroup algebra $F_q[S]$ also has atomic density zero for any numerical semigroup $S$. We also examine the particular algebra $F_2[x^2, x^3]$ in more detail, providing a bound on the rate of convergence of the atomic density as well as a counting formula for irreducible polynomials using Möbius inversion, comparable to the formula for irreducible polynomials over a finite field $F_q$. (Received September 15, 2020)