Experimental evidence strongly suggests that neutrinos oscillate and have mass, emphasizing the importance of searches for lepton-number-violating interactions. The neutrinoless double beta decay $\Xi^- \to p\mu^-\mu^-$ is a test of lepton-number conservation and probes physics beyond the Standard Model. Based on a large number of hyperon decays, collected by Fermilab experiment 871 (HyperCP), we report on a search for this decay mode. Our result improves upon the current limit by several orders of magnitude.