Femoral components of hip replacements are commonly anchored in the femur with bone cement or poly(methyl methacrylate) (PMMA). Wear or fracture of bone cement can lead to loosening of the femoral component, which drastically affects the success and longevity of hip replacements. Self-reinforced composite PMMA (SRC-PMMA) has been previously developed for potential use, as a precoat material for hip replacements. The composite consists of high strength fibers that have been shown to have greatly improved mechanical properties over bulk PMMA. The goal of this work was to examine SRC-PMMA for improved wear properties, as a function of processing temperature. Pin-on-disc tests were used to characterize and rank the wear rates of SRC-PMMA and PMMA. Composites made with higher processing temperatures had significantly lower wear rates than do PMMA at a significance level of $p < 0.05$. The lowest wear rate was 8.2 $\mu g/m$, at a processing temperature of 136°C, compared to a wear rate for PMMA of 13.3 $\mu g/m$. At the lowest processing temperature (105°C), a wear rate higher than PMMA was found, and failure was dominated by fiber delamination. In the more completely processed samples ($122°C < T < 150°C$), wear rates were equivalent to or better than PMMA, and smoother and more homogenous wear was noted in wear tracks. Fatigue cracks were prominent at higher processing temperatures or when the wear pin was riding orthogonal to fibers. Wear particles were collected and examined. Wear particle diameter and aspect ratio showed no correlation to processing temperature, but were similar to particles retrieved from human tissue samples.