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We show that if L is an oriented strongly quasipositive link other than the trivial knot or a quasipositive link which is not smoothly slice, then the Alexander polynomial and signature function of L determine an integer $n(L) \geq 1$ such that $\Sigma_n(L)$, the n -fold cyclic cover of S^3 branched over L , is not an L-space for $n > n(L)$. If K is a strongly quasipositive knot with monic Alexander polynomial such as an L-space knot, we show that $\Sigma_n(K)$ is not an L-space for $n \geq 6$, and that the Alexander polynomial of K is a non-trivial product of cyclotomic polynomials if $\Sigma_n(K)$ is an L-space for some $n = 2, 3, 4, 5$. Our results allow us to calculate the smooth and topological 4-ball genera of, for instance, quasi-alternating quasipositive links. They also allow us to classify strongly quasipositive alternating links and 3-strand pretzel links. (Received July 19, 2017)