

1023-05-848

**D Christopher Stephens** ([cstephen@mtsu.edu](mailto:cstephen@mtsu.edu)), Department of Mathematical Sciences, Middle Tennessee State University, Murfreesboro, TN 37132, and **Xiaoya Zha\*** ([xzha@mtsu.edu](mailto:xzha@mtsu.edu)), Department of Mathematical Sciences, Middle Tennessee State University, Murfreesboro, TN 37132. *Spanning subsets of toroidal and Klein bottle embeddings.*

Let  $\Phi$  be an embedding of graph  $G$  in a surface  $S$ . If there exists a subset  $K$  of  $S$  bounded by a subgraph of  $G$  which contains all vertices of  $G$ , then  $K$  is called a *spanning* subset of  $\Phi$ . Examples of spanning subsets include spanning discs, spanning annuli with some number of holes (called planarizing sets in some papers). A spanning subset may provide a simpler structure but still contain enough information to approach certain problems about graphs embedded on surfaces. In this talk, we discuss the existence of various spanning subsets in toroidal and Klein bottle embeddings. In particular, we show that any embedding of a 4-connected graph  $G$  in the torus with representativity at least three has a spanning disc, i.e., a contractible disc bounded by a cycle of  $G$  which contains all vertices of  $G$ . (Received September 22, 2006)