

Homework #3  
2.800 Fall 2003

1. Suppose that we have made a special iron/titanium carbide alloy. The titanium carbide is in the form of fine particles (0.1 microns in diameter) uniformly dispersed throughout the iron matrix. The total volume fraction of titanium carbide is 1%. Estimate the wear rate and the wear coefficient of this material when it is sliding against the identical material. Assume the applied load is high enough to cause plastic deformation of the sub-surface.
2. A cam/follower system is designed to control the opening of a valve. To reduce the wear of a cam made of heat treated 1045 steel, it was coated with TiC. The follower, which slides on the cam, is made of 52100 steel. The load applied by the follower on the cam can vary from a low load to extremely high load. Describe how the cam coated with TiC is going to wear as a function of the applied load. Estimate the maximum load that can be applied by the follower without damaging the coating.