Solid oxide fuel cells (SOFCs) provide fuel flexibility, low environmental impacts and the highest efficiency of any chemical-to-electrical energy conversion technology. Unfortunately, oxygen transport, especially surface exchange kinetics at the cathode, limits overall SOFC performance. In the common SOFC material La_{0.6}Sr_{0.4}FeO_{3-δ} (LSF64), efforts to engineer and understand oxygen surface exchange have been complicated by the 5 orders of magnitude chemical surface exchange coefficient (k) discrepancy reported in the literature. To help remedy this discrepancy, a new bilayer curvature relaxation technique utilizing the mechano-chemical coupling of LSF64 was developed in this work. This technique provides reliable, in-situ, electrode-free, simultaneous measurement of film stress and k as a function of temperature and oxygen partial pressure. This is demonstrated here by measuring LSF64 films prepared via sputter deposition, pulsed laser deposition and colloidal spray deposition. The similarities and differences between these films are systematically investigated across multiple thermal cycles, and correlated to the microstructure, stress state and sample preparation/testing history. Further, the k and chemical stress of LSF64 films were measured here below 500°C for the first time. This work provides a unique in situ technique for characterizing the stress and
transport properties of mechano-chemically active materials and highlights the various factors affecting oxygen surface exchange.

*Persons with disabilities have the right to request and receive reasonable accommodation. Please call the Department of Chemical Engineering and Materials Science at 355-5135 at least one day prior to the seminar; requests received after this date will be met when possible.*