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Correlating adsorption properties and tribological properties of protein in model synovial fluids[1] JANET WONG, MARIA PARKES, PHILIPPA CANN, CONNOR MYANT, Imperial College London — Human synovial fluid acts as a lubricant in our joints. It consists of many constituents and proteins are believed to play a crucial role in minimizing friction by maintaining both the viscosity of the fluid and a boundary film. While the importance of protein surface adsorption in the formation of boundary protective film may seem intuitive, a relationship between protein adsorption and its resulting tribological properties remains unclear. In this work, the surface adsorption of Albumin and Globulin, the most abundant proteins in synovial fluid, is investigated under static condition using quartz crystal microbalance in various buffer solutions. The tribological properties of the protein solutions are then studied by shearing protein solutions in model point contacts and monitoring the thickness of protein boundary protective layers with time. The effects of pH and ionic strength are examined. While the results suggest that both the static protein adsorption process and the boundary film formation in a tribological contact are strongly affected by pH of the buffers, the link between the two processes is much weaker than expected. Other processes, such as the formation of metal protein complex, can be more crucial in protein boundary film formation.

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