Abstract:
Solutions of manually purified gastric mucins have been shown to be promising lubricants for biomedical purposes, where they can efficiently reduce friction and wear. However, so far, such mucin solutions have been mostly tested in specific tribological settings, i.e., in combination with different material pairings; variations in the composition of the lubricating fluid have not been systematically explored yet. We here fill this gap and determine the viscosity, adsorption behavior, and lubricity of porcine gastric mucin solutions on hydrophobic surfaces at different pH levels, mucin and salt concentrations, and in the presence of other proteins. We demonstrate that mucin solutions provide excellent lubricity even at very low concentrations of 0.01% (w/v), over a broad range of pH levels and even at an elevated ionic strength. Furthermore, we provide mechanistic insights into mucin lubricity, which help explain how certain variations in physiologically relevant parameters can limit the lubricating potential of mucin solutions. Our results show that solutions of manually purified mucin solutions can be powerful biomedical lubricants, e.g., serving as artificial joint fluids for viscosupplementation, as eye drops or mouth spray, or as a personal lubricant for intercourse.