In this study, we investigated two conducting polymers (polydopamine (PDA) and polypyrrole (Ppy)) for yeast cell modification to improved charge transfer across yeast cell membrane/wall. This could potentially help to advance the design of yeast-based microbial fuel cells. Modification utilizing Ppy was based on our previous reports [1]. However, concerns in reduced cell viability over 24 hour modification [2] led us to test shorter modification times. Various modification times with PDA were also examined. The modification with PDA was attempted to control by manipulating incubating buffer basicity from pH 5.0 to 7.5 [3]. Chemically formed PDA was optically evaluated by utilizing UV/VIS spectrophotometry and FTIR spectroscopy. For subsequent analysis we constructed a controlled flow-through system with a free flowing yeast cells to imitate a part of simplified commercial microbial fuel cell system. The modified cells with both conducting polymers were evaluated electrochemically by subjecting cells to three electrode flow-through system using amperometry and in two electrode microbial biofuel cell using potentiometry. Yeast cell modifications with both conducting polymers increased charge transfer efficiency from cells towards electrodes. Yeast cells, which undergo rather short incubation in polymerization bulk solutions, generated higher electrical current compared to long modification time and PDA modified cells generated 5 – 6 times more power density.