TITLE STUDY ON NATURAL RUBBER SHEETS COATED WITH POLYETHYLENEIMINE-FUNCTIONALIZED CORE-SHELL MICROGELS : WATER ABSORPTION AND ANTIBACTERIAL ABILITIES.

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ABSTRACT The natural rubber (NR) sheets were successfully modified by the deposition of poly(2-hydroxyethyl methacrylate)/polyethyleneimine (PHEMA/PEI) and poly(2- hydroxyethyl methacrylate-co-acrylamide)/polyethyleneimine (P(HEMA-co-Am)/PEI) core- shell microgels via a simple dipping method. The PHEMA/PEI and P(HEMA-co-Am)/PEI core-shell microgels were synthesized by an emulsifier-free emulsion polymerization. The PHEMA/PEI core-shell microgel was prepared with varying amounts of N,N- methylenebisacrylamide (MBA) cross-linker from 0.01 – 0.03 g to determine water absorption. The PHEMA/PEI core-shell microgel exhibited the highest percentage of water uptake (330 %) when adding MBA cross-linker 0.01 g. Thus, this formula was chosen for synthesizing the P(HEMA-co-Am)/PEI core-shell microgel with varying HEMA : Am weight ratios while that of PEI : MBA was kept constant at 1.00 : 0.01. The results showed that the water absorption of P(HEMA-co-Am)/PEI core-shell microgel increased 150 - 160 % compared to that of PHEMA/PEI core-shell microgel. The presence of both microgels on the rubber sheets was clearly observed under scanning electron microscope (SEM). The reduction of water contact angle of both rubber sheets coated with PHEMA/PEI (from 92 í to 41 í) and P(HEMA-co-Am)/PEI (from 92 í to 30 í) core-shell microgels confirmed that the hydrophilicity of rubber sheet increased. The water absorption of rubber sheet coated with P(HEMA-co-Am)/PEI core-shell microgel was higher than that of the rubber sheet coated with PHEMA/PEI core-shell microgel, attributed to the higher water absorption ability of the P(HEMA-co-Am)/PEI core-shell microgel particles. The result of tensile property also showed that the coating with both microgels did not affect the bulk property of rubber sheets, but the result of peel property imparted the reduction of interfacial adhesion compared to the uncoated rubber sheet. In addition, the adsorption of both microgels on rubber sheet was sufficiently stable under stretching condition. It is also found that both of PHEMA/PEI and P(HEMA-co- Am)/PEI core-shell microgels exhibited stronger antibacterial activity against S. aureus than E. coli. However, P(HEMA-co-Am)/PEI core-shell microgel showed higher antibacterial activity against S. aureus and E. coli than PHEMA/PEI core-shell microgel.