Abstract

Food deterioration by the pathogenic bacteria is a serious concern for the reduction in shelf-life of food, and an increase in food-borne illness. Low-density polyethylene (LDPE) film is extensively used as a food packaging material. In this work, an attempt is made to study the effects of immobilizing an antimicrobial peptide (AMP) on LDPE film, and gauge the changes in its properties towards compatibility as a packaging material. For this purpose, two types of commercially used LDPE films are taken: White Milk Pouch (MLP) (75µm thick) and Transparent (TRSP) (25µm thick) LDPE film. The C-terminal of an antimicrobial peptide, termed as KLR, having amino-acids sequence 'K-L-L-L-R-L-R-K-L-L-R-R', is immobilized on LDPE film surface using EDC/Sulfo-NHS coupling strategy. The surface characteristics of treated films are evaluated at each modification step, using contact angle analysis and atomic force microscopy. The KLR treated TRSP films show good antibacterial activity (>99%) against *E.coli* growth, however, the MLP films do not show as effective antibacterial activity. Tensile testing of the modified films show no significant change in tensile strength and elongation for MLP films, but both tensile strength and elongation are drastically reduced for the TRSP films. The UV-Ozone treatment carried out to prepare the film surface for peptide attachment appears to be the cause of this reduction. Shorter treatment time may result in antibacterial films that retain their mechanical properties.

Keywords: low-density polyethylene (LDPE), surface modification, antimicrobial, food packaging, antimicrobial peptide (AMP)