Antimicrobial beeswax coated polylactide films with silver control release capacity.

Although the application of silver based antimicrobial systems is a widespread technology, its implementation in areas such as food packaging is still challenging. The present paper describes the fabrication of poly(lactic acid) (PLA) coated with beeswax with controlled release properties for sustained antimicrobial performance. Release of silver ions from the polymers was monitored voltammetrically under various conditions (surface contact, immersion in various liquid media and at different pH values) throughout at least 7days. A higher release was noted with decreasing pH while surface release was much slower than the release when immersed in liquid medium. While uncoated films demonstrated a high burst release which in some instances implied surpassing some current migration restrictions (<0.05mg/kg food), the addition of a beeswax layer allowed a sustained release of the antimicrobial compound. Increasing the thickness of the beeswax layer resulted in an increase in the water barrier properties of the films while reducing the relatively constant values of sustained release. Antimicrobial performance was correlated with the release of silver ions, indicating threshold concentrations for biocide action of <6μg/L and 9-14μg/L for surface contact and in liquid media, respectively. Either by surface contact or by immersion in growth medium or vegetable soup, the coated films displayed a strong bactericidal effect against Salmonella enterica. The application of this functional barrier thus offers the possibility of tuning the release profiles of the films to suit a specific application and puts forth the possible suitability of these materials for food packaging or other migration sensitive applications.