Evaluation of corrosion resistant coatings in metal cans used for heat treated packaged foods

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This study investigated heat-induced changes to chemical compounds in tomatoes and chicken and examined how these compounds initiated morphological changes to corrosion resistant polymeric coatings laminated to the internal wall of metal food cans. Changes to the coating were measured using X-ray diffraction, Fourier transform near-infrared spectroscopy, and scanning electron microscopy. The elemental composition of the coatings in the cans before and after heat processing were investigated using energy-dispersive X-ray spectroscopy (EDS). As controls, some cans were not filled with the tomatoes and chicken, and some cans were filled with these foods then sealed, but not heat-treated. For the heat-treated tomato and chicken-filled cans, they were sealed, retorted (at 121 °C, 30 min), then stored at 49 °C for 50 days. Selected-ion flow-tube mass spectrometry was then used to measure the concentrations of volatile compounds (sorbed from the tomatoes and chicken) in the polymeric coatings of the unprocessed and processed cans. The results showed that thermal degradation of amino acids in the tomatoes and chicken gave rise to volatile methyl sulfides that were subsequently sorbed by the cans coatings. This process caused chemical modifications to the coatings, changes to their morphologies, moisture uptake by their polymeric structures, delamination, and exposure of the base-metal in the cans. These changes allowed electrolytes, gases and moisture in the tomatoes and chicken to initiate corrosion in the walls of the cans. As a result of the corrosion, tin and iron sulfide formed and migrated from the walls of the cans towards the tomatoes and chicken. The concentration of these metallic compounds in the coating and food items were quantified using induction coupled plasma and EDS. These results provide us with a better understanding of how tomatoes and chicken give rise to corrosion in metal cans.