This thesis presents work that was done within the Swedish Centre for Resource Recovery (SCRR). Research and education performed within SCRR identifies new and improved methods to convert residuals into value-added products. SCRR covers technical, environmental and social aspects of sustainable resource recovery.

The extensive and reckless usage of single-use conventional plastics, creates shortage in the valuable oil supply, kills numbers of species, contaminates our oceans, increases greenhouse gas emissions, leads to aesthetic nuisances, pollutes the food chain and plastics are considered as the major toxic pollutants of present time. The replacement of conventional plastics with biodegradable and bio-based plastics is one possible way to address today's plastic pollution. The land use for cultivating crops for bio-based plastics is however still negligible, the interest in utilization of secondary feedstock for the production of bioplastics has been emerging. The recovery of lignocellulosic by-products further reduces the arable land used, feedstock greenhouse gas emissions and other feedstock related impacts.

Lignocellulosic by-products such as forest residues and by-products of food processing industries have a good potential in the production of different bio-based plastics through processes that usually involve more than one production stage. An example for that is the production of lactic acid from lignocellulosic waste via fermentation that is then used for the production of the bioplastic polylactic acid. An emerging trend in bioplastics research is however, the transformation of the entire residue of industrially processed vegetables and fruits without separation, directly into biomaterials. In this thesis, the production of flexible biofilms and solid biomaterials were carried out from orange waste and apple pomace. Both residues are sources of industrial pectin production and have relatively high cellulose content which materials have been intensively researched for the production of bio-based materials.

Biofilms and 3D biomaterials fabricated in this thesis had mechanical properties comparable with commodity plastics, but further improvements e.g. on the water resistance and upscaling are needed for orange waste and apple pomace to become the raw materials of the next generation bioplastics.

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