Summary of the final report
Removing of specific undesirable odours with the development of new food packaging materials (RemOpack)

For many food products, there exist some odours that are often referred to as “confinement odours”. These very unpleasant odours are due to the presence of small amounts of sulphide, aldehyde and amine compounds. These odours are trapped by the gas barrier packaging and will accumulate during the shelf-life before being released when it is opened. These odours – which are usually harmless at these concentrations – do not generally indicate any deterioration of the food but will lead to a rejection by the consumer of a suitable product. Therefore, the aim of this project was to develop and design a novel packaging concept that will remove these off-odours for food products with odour issues. The project was sequenced in three main steps listed below:

- Identification of the most interesting food products and analysis of the molecules responsible for the off-odours.
- Development of innovative plastic and paper packaging presenting a capacity to reduce off-odours
- Volatile organic compounds (VOCs) analysis of packaging containing food products in real storage conditions and analysis of packaging recycling or biodegradability.

The project consortium consisted of relevant association research centres namely Certech, Celabor and ATB and was supported by SMEs from the entire value chain. The expertise of the different partners of the project included food packaging, volatile organic compounds (VOC) emission, polymer films, additives, fillers, absorbents, paper and carton-board.
The selection of the food products consisted of four foods products: white sausage, rucola, chicken fillet and smoked fish. The off-odours of these products were identified. The results obtained on the characterization emitted by the food products and the virgin packaging have permitted to establish a list of VOC that will be used as simulants for the characterization of the capacity of adsorption of the odours scrubbers. The selected simulants were Dimethyl sulphide (DMS); Dimethyl disulphide (DMDS); methyl-ethyl-ketone (MEK); α-Pinen; Ethyl-butyrate;and 3-methyl-1-butanol.Thiols have not been selected as they present an elevate toxicity.
Different types of odours scrubbers were tested for their adsorption capacities: activated charcoal, zeolite, fatty acid salt and beta-cyclodextrin. Among these, activated charcoal (charcoal 1 & 2) and zeolites (zeolite 1 & 2 and CBV 298014) were the most efficient odours scrubber. Hence, activated charcoal and zeolites were used for the subsequent preparation of polymer and paper films containing odours scrubbers. The most promising results in terms of VOC adsorption was obtained with a high viscosity LDPE film containing 25 wt.% of activated charcoal. The most efficient functionalized papers and nanocellulose films were filled in a food packaging in presence of selected food (rucola, white sausage). This step was necessary in order to prove the adsorption efficiency of developed papers and films in presence of food emitting VOCs responsible for the off-odours.

With the exception of the odour, no quality differences or visual deviations were observed for both products, which mean that both materials had no negative influence on the packaged products. In the case of packaged rocket salad, there was essentially a continuous increase in dimethyl sulphide and dimethyl disulphide during storage, which can have a negative effect on odour at higher concentrations. An increased concentration of 2,2-dimethyl-decane was also detected from the beginning, which probably emitted directly from the commercial packaging, but had no negative effect on the smell.

IVLV members can download the final report from our website. All you need is to register in the section "My IVLV". Non-members of the IVLV can order the final report for a fee from the IVLV office by office@ivlv.org .

The IGF project no. 195 EBR presented here by the Research Association of the Industrial Association for Food Technology and Packaging (IVLV e.V.) is funded by the Federal Ministry for Economic Affairs and Energy via the AiF as part of the program for the promotion of industrial community research (IGF) based on a decision of the German Bundestag.