Hybrid gels are biphasic systems formed by conjugating hydrogels and oleogels. The mixture of water-based and oil-based gels provides distinct and unique characteristics to hybrid gels, and based on the structurant molecules and mixture ratio used during their production, different textural and rheological properties can be obtained. Hybrid gels remain a very recent topic concerning pharmaceutical and food applications and despite recent studies on the use of hybrid gels for controlled delivery of compounds (pharmaceutical applications) these structures are still understudied in regard to their food application possibilities [1, 2].

To improve knowledge and expanding ways to use these systems, it is important to understand how these gels behave regarding textural and rheological properties. Also, the knowledge on their micro and nanostructure allows tailoring their properties and thus maximizing their applicability in foodstuffs. We report on how the combination of a beeswax-based oleogel and a sodium alginate-based hydrogel influences the gel structural properties at macroscopic (rheological and textural), microscopic (optical microscopy) and molecular (X-ray diffraction) levels. Different ratios of both hydrogel and oleogel were used in order to evaluate the hybrid gels' behaviour in terms of morphological, textural, rheological and polymorphic properties. Differences regarding oleogel particles distribution in the hydrogel matrix were noticed with the increase of oleogel fraction. A more disarranged distribution of oleogel particles was observable for the 50:50 ratios of hydrogel and oleogel. X-ray diffraction data unveiled that once polycrystallinity is reached (in hybrid gels) these patterns remain persistent for all tested ratios. Oleogel showed d-spacings in the range of 3.74 to 8.04 Å. Hybrid gel samples (and hydrogel control) are semi-crystalline, displaying spacings ranging in intervals of d(001) 6.99 – 7.18 Å; d(002) 3.09 – 3.23 Å and d(003) 2.45 – 2.46 Å, respectively. The samples with increasing oleogel ratio revealed a firmness decrease and a consequent reduction of spreadability values. Consequently, is observed less adhesivity for these samples, due to a more pronounced disaggregated structure. For all hybrid gels a gel-like behaviour (G’ > G”) was observed. Results showed that it is possible to modify the hybrid gels’ rheological and textural behaviour by a controlled mixture ratio of oleogels and hydrogels. This opens the possibilities of food applications for this kind of systems.

References: