THE EFFECT OF MICROCAPSULE SIZE ON THE OXIDATIVE DECOMPOSITION OF CORE MATERIAL

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The pH of preparation has been found to be one of the factors controlling both the extent of complex coacervation and, provided the droplet size of the core material is smaller than the coacervate droplet, the size of the final microcapsule. The size of microcapsules with gelatin-gum acacia walls and a benzaldehyde core was largest at pH 4.1. The limits of pH for the formation of coacervate and microcapsules were 3.0-4.5. As the upper or lower extremes of production are approached the microcapsule size becomes smaller provided other preparative factors are kept constant.

Microcapsules which are treated with formalin have been found to be slightly larger than untreated materials on extraction. It is suggested that this might result from the cross-linking effect of formalin preventing shrinkage of the wall during the dehydration and drying process. This would form a more permeable friable wall for the hardened material.

Oxidation of the benzaldehyde has been studied using a Warburg respirometer and a range of microcapsule sizes, both formalised and non-formalised. The rate of oxidation of the formalin hardened samples was far more rapid than those whose microcapsule wall had not been fixed with the tanning agent.

Microcapsules of large diameter contain a proportionately larger amount of encapsulated benzaldehyde, frequently in individual droplets. These larger microcapsules have a more rapid oxidation rate when compared with the same amount of benzaldehyde distributed throughout smaller microcapsules, although the latter will have a larger overall surface area. The oxidation rate was found to be independent of microcapsule surface area and the bulk droplet size of the encapsulated material appears to be more important. The induction period found with small microcapsules was also much longer. In no case was oxidation completely suppressed and the inclusion of an antioxidant would still be required to afford complete protection for microencapsulated oils.

Table 1. The effect of preparative pH on the size and oxidative rate of benzaldehyde containing microcapsules

Preparative	Formalin treated				Untreated			
pH	a	b	c	d	a	b	c	d
4.5	96	366	53.3	180.0	78	384	20.0	2400.0
4.3	145	313	240.0	90.0	136	310	137.5	180.0
4.1	155	264	372.7	60.0	148	300	177.8	180.0
3.8	124	325	146.0	120.0	111	349	50.8	240.0
3.5	93	445	45.8	1200.0	61	575	19.0	360.0
3.0	59	764	-	-	43	952	-	-

a) mean size diameter, μm
b) specific surface area, cm^2/cc.
c) rate of oxidation, μl/hr/l of dispersion.
d) induction period, min.