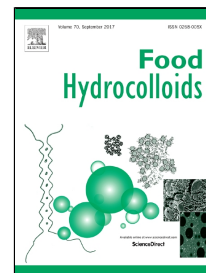


# Accepted Manuscript

Multiscale evaluation from one bubble to the foam of surface active properties of cellulose derivatives used for a starchy model sponge cake

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6  
7 Key words:

8 Cellulose, air/water interface, tensiometry, viscoelasticity, functional properties

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10 Highlights:

- 11 - Static and dynamic tensiometry showed good interface stabilization by HPMC and MC
- 12 - HPMC and HPMC+MC solutions were the only ones able to form a stable foam
- 13 - MC had lower viscosity and shear-thinning properties while forming more rigid interfaces
- 14 - A synergistic effect was shown for HPMC and MC in stabilizing foams

15  
16 Abstract

17 Interfacial properties of cellulose derivatives (HPMC and MC) were studied to understand their role in  
18 structuring a foam during the whipping process. Multiscale studies were performed to explain  
19 macroscopic observations with microscopic mechanisms. Results showed that HPMC was more  
20 flexible and had higher viscosity and shear-thinning properties than MC, which in turn diffused  
21 quicker to the interface due to a smaller molecular weight. Both hydrocolloids showed a good ability  
22 to stabilize interfaces through their surface tensions and dilatational moduli measured by static and  
23 dynamic tensiometry, respectively. However, only HPMC and HPMC+MC solutions were able to  
24 develop a stable foam. Methylcellulose formed more rigid interfaces and the interfacial elasticity was  
25 probably too high, leading to a difficult fractionation of bubbles. Moreover, its lower viscosity  
26 measured at low shear rate could explain its incapability to retain bubbles in the bulk just after their  
27 formation. HPMC and MC display complementarity and synergistic effects when used together, since

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