Low Substituted Methylcellulose Binder for Improved Ceramic Extrusion

Dow Wolff Cellulosics has developed a new class of methylcelluloses (MC) for ceramic extrusion at elevated temperatures which provide higher shape retention of the wet green ware. First performance data of this new material was presented at the 12th Conference of the European Ceramic Society (ECerS XII) in Stockholm in June 2011. Now a technical paper has been published by R. Bayer and M. Knarr in Journal of the European Ceramic Society, Volume 32, Issue 5, Pages 1007–1018 (http://dx.doi.org/10.1016/j.jeurceramsoc.2011.11.025).

In this paper, the authors describe how the degree of substitution of methylcellulose (content of methyl groups, DS (Me)) affects the characteristics both in aqueous solution and in ceramic cordierite pastes with a special attention to the gelation temperature.
Rheological measurements of aqueous methylcellulose solutions clearly show an increasing gelation temperature with decreasing substitution level. Furthermore, the formed gel at higher temperatures tends to weaken with decreasing methyl group content. Both effects were observed in ceramic paste as well: the gelation temperature increases with decreasing substitution level which results in an extrusion pressure increase. The pressure increase as well as the peak area indicating the gel strength is getting smaller with a lower substitution.
This temperature dependent behavior is of high importance for a variety of processes dealing with pastes at various temperatures.

The standard available methylcelluloses for ceramic paste extrusion lead to higher paste brittleness when the temperature is reaching the gelation point due to higher substitution levels. This makes extrusion at even higher temperatures impossible.
These newly developed methylcelluloses enable ceramic paste extrusion at significantly higher temperatures up to 90 °C. Consequently, this provides the opportunity to increase the extrusion rates since the larger heat evolution due to higher friction does not lead to the risk of paste gelation during processing.