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## Ingredients

Multifunctional natural compound based on cereal and fruit fibres

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Effective innovation management

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Aerosols – interesting new product concepts

## VIP of the Month



Dr. Diana Ciccognani of Lonza presents a method to make challenge tests more efficient and more sustainable



## Multifunctional plant-based compound for

# ... EO-free formulations



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**Berg & Schmidt has developed a multi-functional ingredient based on natural cereal and fruit fibres, and which they have named BergaMuls ET 1. Its emulsifying and thickening properties allow the sustainable production of O/W creams that can be cold processed, are skin tolerant and elegant, and can be marketed as “emulsifier free” in many countries.**

*Compatibility with oils of different polarities*

**F**or a few years now there has been an increasing demand for natural but stable, and universally applicable, additives such as thickeners and

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emulsifiers<sup>1</sup> which will support the production of sustainable and natural trend-setting products. However “EO-free” systems are not always as easy to process as their synthetic alternatives<sup>2</sup>. Modern emulsions such as creams lotions or gels must have a robust stabilising system which meets the legal requirements concerning product life. This may be via boundary layer stabilisation by using casein/maltodextrin systems<sup>3</sup>, by the adsorption of insoluble starches<sup>4</sup>, boundary layer polymerisation<sup>5</sup> or stabilisation with food proteins or polysaccharides<sup>6</sup> as well as

many other applications<sup>7-10</sup>. At more than 40 °C stability is reduced, an elegant and pleasant skin feel is difficult to achieve, and because of processing difficulties production becomes costly.

**BergaMuls ET 1** is a natural compound based on swellable, soluble and insoluble natural cereal and fruit fibres. It combines the features of classic O/W emulsifiers with those of plant based thickeners and has, therefore, emulsifying and thickening properties at the same time. Using this compound it is possible to produce, long-term stable, skin tolerant and elegant O/W creams with no special technical costs and which in many countries can even be marketed as “emulsifier free”.

The natural compound has to be first suspended in the oily phase. Then the aqueous phase is added whilst stirring. With no limitation of product performance it is also acceptable to process the product either under cold/cold or hot/hot conditions. Energy cost-savings can be made by using a

cold/cold process. Although the ingredient can be added both to the oily or the aqueous phase the best results are achieved with systems where the substance is added to the oily phase.

### Compatibility with other components

Using this natural compound O/W emulsions with high electrolyte tolerance can be produced. Even after adding 5% NaCl solution the emulsion stays unchanged and retains its long-term stability. Based on this natural compound, also aqueous phases with a pH as low as 3 can be easily processed. Thanks to its electrolyte tolerance and pH stability BergaMuls ET 1 can be used almost universally as a natural interfacial stabilizer and also, under certain conditions, as a thickener.

Besides manufacturing of electrolyte solutions, this compound allows work with oils of different polarities – be they natural or synthetic. Non-polar paraffins and silicone oils are just as reliably emulsified as, for instance, polar spreading oils or natural sunflower oil. At low levels of additive concentration the substance acts just as natural interface stabilizer.

Higher concentrations of this natural compound have either selfthickening properties and form interface stabilizing gel network structures that still needs further characterization. In general the “Up-is-up” principal applies – i.e. the higher the polarity the higher the viscosity of the emulsion. Thus costly amounts of additional thickeners may not be required. The type of thickening can be shown electron-microscopically as a gel network type of structure.

### Results of the latest studies

The additive forms stable emulsions with a homogenous droplet size distribution, even with low energy in-

put and under cold conditions (room temperature). Research into the fibre compound using a scanning electron microscope (SEM) and applied in a standard system of 5% BergaMuls ET 1, 30% caprylic/capric triglycerides and 65% water, shows the structural formation of such systems. In this formulation the compound forms an almost honeycomb-like gel network around the oily droplets.

Under the SEM the system is similar to those gel network structures that can happen in highly stable classic emul-

sions due to an excess of ethoxylated emulsifiers. The difference here is that this is a purely natural ingredient. Furthermore under the electron microscope a regular distribution of solid agglomerates can be seen in the gel network itself, and also around the oil droplets.

REM images with a higher resolution (10,000x) allow us to see a finer representation of this structure. The enclosure of the solids can be identified here as regular mottling in the gel network. The functional contribution of

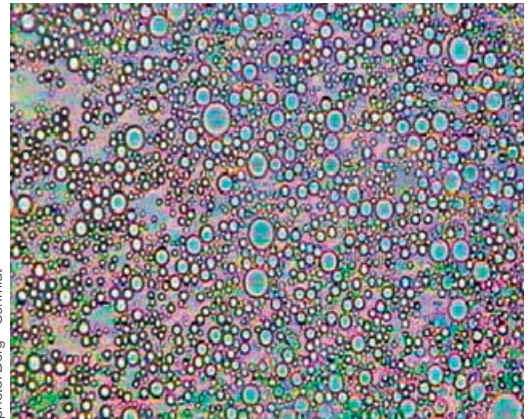


photo: Berg + Schmidt

Microscope photo of a cold/cold produced O/W emulsion with 5% BergaMuls ET 1

### Advantages at a glance

The natural fibre compound is **easy to handle** in the laboratory, in the scaling up industrial phase and in full production. It allows the production of elegant, **electrolyte-containing creams** with the use of various oily components having very different polarities. The emulsifier concentrations are independent of the process temperature. The high **pH tolerance** and the possibility of **cold/cold processing** mean also that the natural emulsifier and thickener can be used on a long term sustainable basis. The resulting O/W emulsions are characterised by **a high temperature resistance and shear force resistance**. Stable systems can be achieved with low shear forces however for luxurious creams an energy input is needed. Microscopic investigations confirm that the ingredient, even at low production temperatures and low shear forces, has a **homogenous droplet distribution**. **Stabilisation** is done in line with the above data about bulked gel structures with surface affine solid enclosures (mottling patterns) which are regularly distributed. Their function will be more clearly identified in subsequent research.

these solid agglomerates for the stabilisation creams formulated with BergaMuls ET 1 is to be investigated in further studies.

Reference list and additional information can be found on the Internet – see Internet box

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