

Polyglycerols and their derivatives have a broad range of applications (Table 1). MPOB has developed a process to produce polyglycerols (Figure 1) by microwave heating with a substantially reduced reaction time. Glycerol is polymerized at elevated temperatures, preferably 250°C-270°C, in the presence of a catalyst. However, a drawback is the tendency to produce highly coloured products, when light colour is desired, especially in the food and cosmetics industries. So, the product has to be bleached.

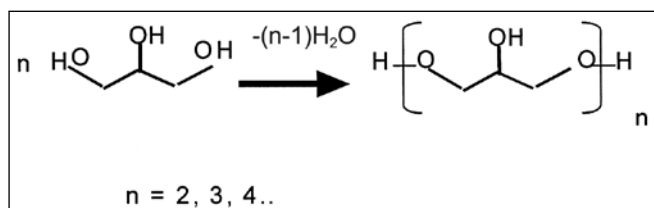


Figure 1. Dehydration of glycerol to polyglycerols.

TABLE 1. APPLICATIONS OF POLYGLYCEROLS AND POLYGLYCEROL ESTERS

Materials	Applications
Polyglycerols	Moisturizing agent in cosmetics and personal care products, such as lotions, shampoo, etc.
Polyglycerol esters	a) Food, cosmetics and pharmaceutical emulsifiers b) Textile lubricants c) Anti-static agents in plastics d) Anti-bloom agents for edible coatings e) Anti-splattering agents in cooking oil

MPOB TECHNOLOGY

MPOB has developed a two-stage bleaching process using two bleaching aids for the polyglycerols produced by microwave heating (Figure 2).

The process was tested on two batches of polyglycerols, and the results shown in Table 2. The colour changes observed are illustrated in Figures 3 and 4.



Figure 2. Microwave reactor.

TABLE 2. COLOUR CHANGES WITH BLEACHING OF POLYGLYCEROLS BY MPOB PROCESS

Polyglycerols	Before bleaching	After bleaching	Reduction (%)
A	15.9R 19.9Y 6.9B	0.9R 2.9Y 0B	94.20
B	13.9R 15.9Y 11.8B	0.7R 1.7Y 0B	94.88

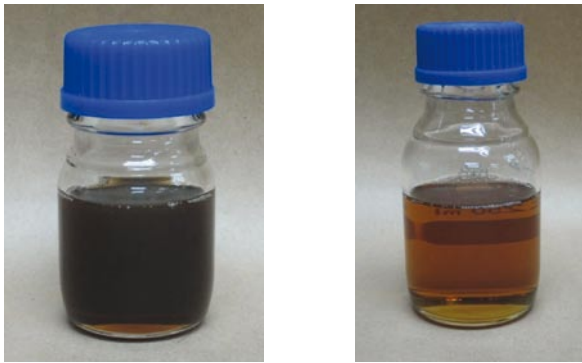


Figure 3. Colour of polyglycerols before bleaching.



Figure 4. Colour of polyglycerols after bleaching.

POLYGLYCEROLS MARKET

In 2006, the global market for polyglycerols was an estimated 40 000 t at USD 4 - USD 5 kg⁻¹. Polyglycerols, particularly polyglycerol esters, are used as food, cosmetics and pharmaceutical emulsifiers. Polyglycerol esters have increased in price over the years, and are expected to continue to do so (Table 3).

TABLE 3. AVERAGE PRICE OF POLYGLYCEROL ESTER AND POLYGLYCEROL METHYL ESTER EMULSIFIERS

Year	Average unit price (USD kg ⁻¹)	Price growth rate (%)
2003	3.59	-
2004	3.88	8.0
2005	4.19	8.0
2006	4.50	7.5
2007	4.82	7.0
2008	5.15	7.0
2009	5.48	6.3
2010	5.79	5.8
2011	6.08	5.0
2012	6.36	4.5
2013	6.64	4.5

Source: Frost and Sullivan (2006).

ECONOMIC ANALYSIS

Return on investment = 22.4%.

Payback period = 4.5 years.

CONCLUSION

The bleaching process improves the colour of polyglycerols produced by microwave heating.

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