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TEDA & TOYOCAT NEWS

Tosoh Corporation

Head Office
Tosoh Corporation
Fine Chemicals Division
1-7-7, Akasaka, Minato-ku
Tokyo, Japan
Phone :(81)-3-3585-9891
Telefax :(81)-3-3588-8120
Person : Takafumi Kiuchi

Europe Office
Tosoh Europe B.V.
World Trade Center C-13,
Strawinskylaan 1351, 1077XX
Amsterdam, The Netherlands
Phone :(31)-20-664-4026
Telefax :(31)-20-662-3412
Person : Peter Bregman

U.S.A. Office
Tosoh USA, Inc.
Suite 600, 1100 Circle 75 Parkway,
Atlanta, Georgia 30339-3097
U.S.A.
Phone :(1)-404-956-1100
Telefax :(1)-404-956-7368
Person : Donald W. Lowe

It is a great pleasure for us to issue the TEDA & TOYOCAT News. Also enclosed you will find our application guide for your reference. It outlines of our full line of services and information. We hope it will serve to help you obtain maximum benefit of our products. We would be glad to supplement this information at some mutually convenient time. In the meantime, please do not hesitate to call upon us if there is some other way in which we can be of assistance.

TOPICS

TOSOH'S STAND & PRESENTATION AT UTECH '94

TOSOH Corporation participated in UTECH94 Exhibition & Conference held on March 22-24 in The Hague, The Netherlands. This UTECH has been held every two years since 1986. TOSOH has exhibited a stand in succession since the first UTECH. The entire polyurethane group (Europe, USA and Japan) and agents from each European country gathered to contact the many visitors.

At the conference, TOSOH presented a variety of new amine catalysts for HR molded foams and discussed the fogging problem in automobiles by the speaker, Mr. Yoshimura of TOSOH Japan. The topics were as follows (cf. Paper 12);

HR foams
- lower density & improved cure
  - F2 & F4
- improved surface cure & moldability
  - M50 & D60

Less Fogging in automobile parts
- D60 & HX63

Especially D60 exhibits less volatility namely less odor, provides improved surface cure and moldability as shown in Figure 1 (Test method is described on page 4). For the reduction of fogging condensates, it is effective to use TCPP oligomers as a flame retardant as well as a less volatile catalyst such as D60 or reactive amine catalysts such as HX63.

The next UTECH meeting will be held in Asia. TOSOH Corporation will also participate and have a presentation at coming UTECH ASIA 95 in Singapore in succession to last UTECH ASIA. The first UTECH ASIA was opened also in Singapore, March of 1993. Next year is the second meeting. Asian polyurethanes industry is now beginning to grow and TOSOH hopes to serve to bridge the information exchange between Western and Asian customers.

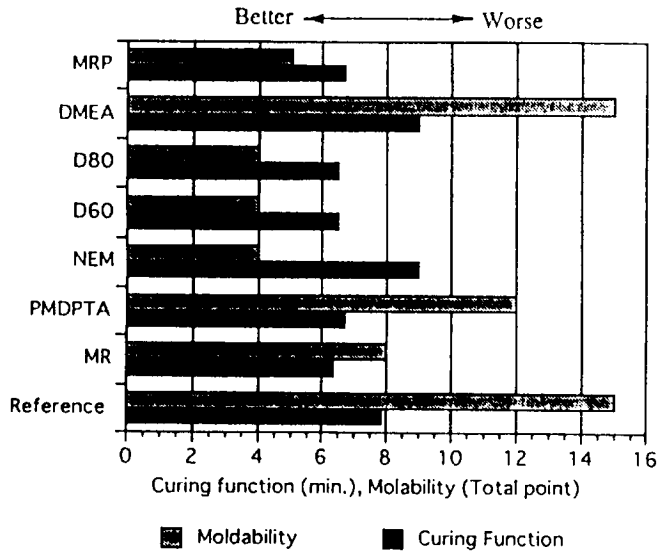

Figure 1. Curing function and moldability in TDI/MDI based HR foam.

REVIEW OF TEDA & TOYOCAT

CHARACTERISTICS OF TOYOCAT-NP

Toyocat-NP has a well balanced catalytic activity between the gelling (urethane formation) and blowing (urea formation) reaction. The catalytic activity of NP is comparable to DMCHA and Toyocat-MR, although NP exhibits a bit stronger blowing activity than DHCHA or MR as shown in Figure 2. Therefore NP can be used as a base catalyst in every application.

Another unique character is that the catalytic activity of NP is thermosensitive, which leads to the following merit in each application.

In flexible slabstock foams ;

NP provided a slightly higher ILD with identical density compared with conventional TEDA-L33(Table 1). Moreover NP exhibited an improved cure due to its strong thermosensitiveness. A curing test was performed by compressing the foam immediately after demolding (5minutes later) for 1minutes. It can be said that the degree of the recovery of the foam after compressing was dependent on cure speed. As shown in Table 2, NP provided high recovery percentage, namely fast cure speed.

In HR molded foams ;

NP is recommendable if fast inside cure as well as higher green strength is desired, especially in thick HR foam.

In rigid foams ;

NP has a tendency to provide an improved flowability as well as a strong compressive strength namely better dimensional stability. For example, in cyclopentane blown foam systems, the combination of NP and TMF provided the best performance in flowability, dimensional stability as well as thermal conductivity as shown in Figure 5 on the next page.

In shoesoles ;

NP provided improved flowability and higher resistance in flexing test compared with traditional TEDA-L33E. Therefore NP would be effective for producing low density type or midsole.

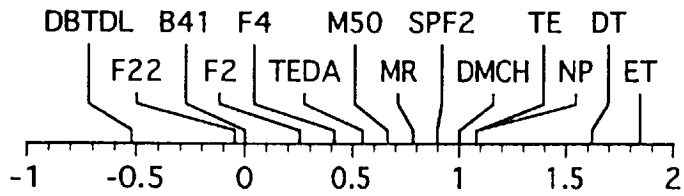

Figure 2. Blowing/Gelation activity ratio (log[k2c/k1c]. cf. Polyurethanes World Congress 1993, p.473)

Table 1. TOYOCAT-NP in Flexible Slabstock Foam

Catalyst			
TOYOCAT-NP		0.09	0
TEDA-L33		0	0.16
Stannousoctoate		0.27	0.27
Reaction time			
Cream Time	(sec)	12	12
Gel Time	(sec)	69	70
Rise Time	(sec)	79	79
Physical properties			
Core density	(kg/m^3)	24.2	24.2
ILD	($kgf/314cm^2$)		
25%		21.7	21.5
65%		44.0	41.8
Tensile strength	(kg/cm^2)	1.03	1.04
Resiliensy	(%)	48	48
Elongation	(%)	170	183
Compression set (%)			
after 22hr at 70°C		1.1	1.2
Air flow	(ft/min)		
Top		4.7	4.7
Middle		3.1	3.2

Table 2. TOYOCAT-NP in HR Molded Foam

Catalyst				
TOYOCAT-NP		0.71	0	0
TEDA-L33		0.23	1.00	0.80
TOYOCAT-ET		0	0	0.16
Reaction time				
Cream Time	(sec)	6	6	5
Gel Time	(sec)	79	79	78
Rise Time	(sec)	104	104	105
Physical properties				
Density	(kg/m^3)			
Core		50.0	49.2	50.0
Overall		55.6	55.5	55.6
ILD	($kgf/314cm^2$)			
25%		21.5	22.2	21.5
65%		56.9	58.0	57.4
Resiliency	(%)	68	66	67
Compression set (%)				
95%RH, 22hr at 50°C		13.8	12.7	14.4
Cure speed *	(%)	81	56	72

* Cure speed was evaluated as a % recovery measured 5 minutes later after the demolded foam was immediately compressed at 62.5% for one minute after demolding (demolding time=5min).

Newly Developed Nucleation Amine Catalyst TOYOCAT-TMF

Innovative tertiary amine catalyst TOYOCAT-TMF, which can be called a nucleation amine catalyst, has been developed by Tosoh Corporation for cyclopentane and HCFC-141b blown rigid foam systems. TOYOCAT-TMF can improve flowability, dimensional stability as well as thermal conductivity which are big problems in both of cyclopentane and HCFC-141b blown systems. These improvement are due to the strong blowing activity of TMF, moreover, improved thermal conductivity was caused by providing fine cell structure, therefore TMF can be called a nucleation catalyst with strong blowing activity.

As shown in Figure 3, the modification of gelling catalyst MR with a strong blowing catalyst DT made it possible to improve the flowability. In spite of the further increase of DT level, the reduction of foam density could not be achieved over 4% compared with the case of MR only. On the other hand, in the case of newly developed strong blowing catalyst TMF, the flowability of foam became better and lower density foams were obtained as the proportion of TMF increased. This result suggests that TMF improves significantly the blowing efficiency of cyclopentane blown rigid foam systems and makes it possible to produce lower density foam by reducing the level of blowing agent. Similarly to DT, the TMF also improved dimensional stability at low temperature as seen in Figure 4.

As shown in Figure 5, in the case of blend catalyst systems with the conventional strong blowing amine catalyst DT, thermal conductivity became worse as the blend ratio of DT increased. This phenomenon indicated that the common blowing amine catalyst improved the isotropy of cell structure but increased the cell size, which resulted in the inferior thermal conductivity. In comparison with conventional blowing amine catalyst, newly developed strong blowing amine catalyst TMF provided lower thermal conductivity. This is considered to be due to the fine cell structure. This fine cell effect of TMF contributes to the acceleration of nucleation formation of cell at the initial stages of foaming.

Details will be presented at SPI94 in Boston.

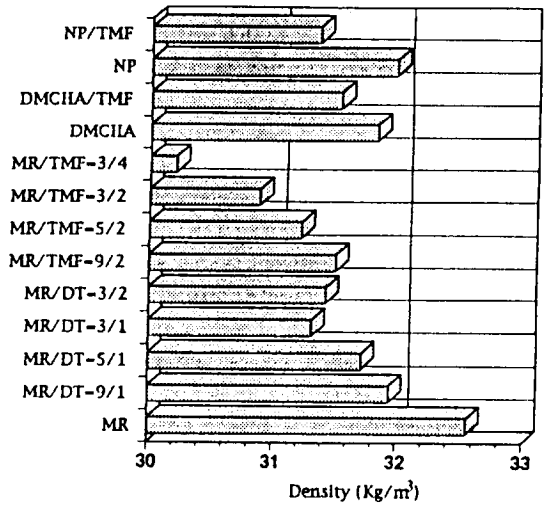

Figure 3. Effect of amine catalyst on foam density.

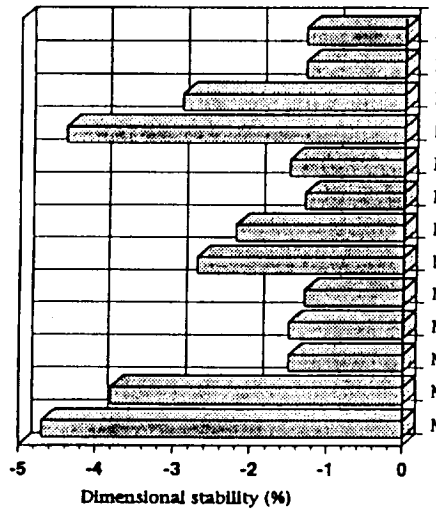

Figure 4. Effect of amine catalyst on Dimensional stability.

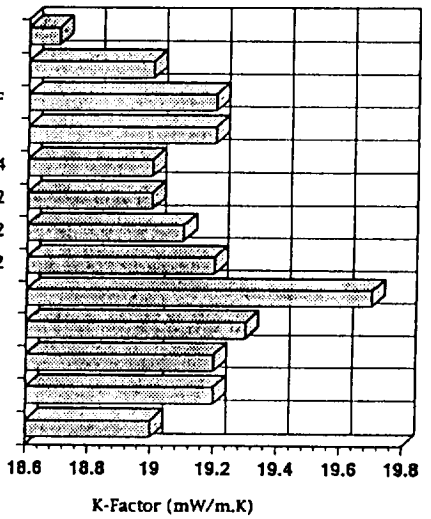

Figure 5. Effect of amine catalyst on K-Factor.

TOPICS IN JAPAN

VACUUM INSULATION PANEL FROM SHARP

One of the major Japanese refrigerator manufacturer SHARP had adopted a vacuum insulation panel (VIP) as an insulation material in their refrigerator. The insulation board is constructed with a VIP and all-water blown polyurethane rigid foam parts. VIP is filled with a silicate, which is said to be a safe and harmless material, in a heat-sealed plastic bag. They announced that the thickness and the thermal conductivity of VIP was 18mm and 7.6 mW/mK respectively. And polyurethane foam parts provided 10mm thickness and 19.5 mW /mK, therefore the total thickness of the wall of refrigerator could be reduced to 28mm, which was almost half of the conventional type of refrigerator. Their biggest size is 447 litters in an internal cubic volume. Moreover HFC-134a is utilized as a refrigerant, therefore they said this new refrigerator was completely CFC-free system.

NEW BLOWING AGENT FROM TOHO CHEMICAL

Toho Chemical, which is a Japanese polyol manufacturer as well as a system house, had announced a new blowing agent, that is 1,3-Dioxolane. Since 1,3-Dioxolane has no halogen in its chemical structure, ODP is said to be zero. They mentioned that 1,3-dioxolane could be mixed with polyol or isocyanate similar to CFC-11, due to its high boiling point (75°C) and better solubility. Concerning flammability, it is said that 1,3-dioxolane provides higher safety since its flash point is higher than cyclopentane (1,3-dioxolane = 2°C, cyclopentane = -40°C). Therefore it is said that this new blowing agent can be utilized with no change on the present equipment. They are now developing a new rigid foam systems using this new blowing agent for appliance as well as construction applications.

INFORMATION

TOSOH WAS AWARDED ISO9002

TOSOH Corporation has been awarded ISO 9002 certification on tertiary amine catalysts TEDA & TOYOCAT as well as ethyleneamines last year. Since ISO 9002 is the international standard for highest quality, our customers can put confidence in assured levels of quality of TEDA & TOYOCAT. Furthermore TOSOH will continue to develop high quality and high performance catalyst systems in future.

TEST METHOD FOR MOLDABILITY & CURING FUNCTION IN HR FOAMS

The moldability and cure speed of the foam is one of the most important factors to improve the productivity of automotive seating. Therefore evaluation method is important for developing suitable catalyst systems.

TOSOH is using special aluminum mold as shown in Figure 6 for the evaluation of cure speed and moldability. At predetermined time, only the mold lid was removed. While retaining the foam in the mold, the cure speed was evaluated by measuring the elapsed time the indentation disappeared or retained full recovery when compressed on the thin part (5mm) of the foam with a fixed weight of 2.5 Kg at regular intervals.

For the evaluation of moldablity, the foam defects such as cell collapse, surface blistering and the peeling of surface skin were measured on the part from A to C as shown in Figure 6.

cf. Proceedings of UTECH94, Paper12

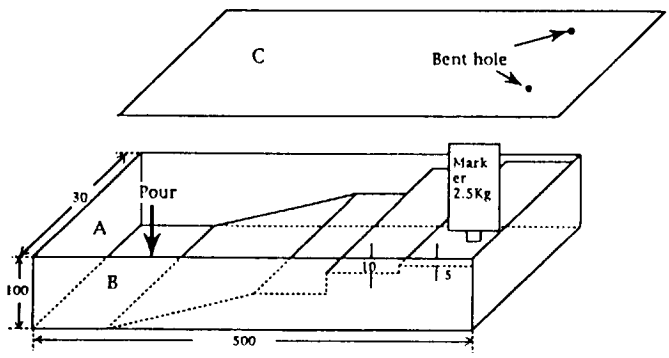

Figure 6. Test mold for curing function and moldability.