Bonding of DATB - Progress Report

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August 2, 1958

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TO: Barney Rubin, Chemistry

FROM: Paul Archibald, Chemistry

SUBJECT: Progress Report - Bonding of DATB

Summary: A series of DATB (diaminotrinitrobenzine) pressings were made in an effort to find the most suitable binder. The requirements for this binder were as follows:

Thermal stability: Must be as stable as DATB or not show any reaction with DATB at 200 °C.

Density: Must press to 95% theoretical or higher.

Compressive Strength: Must be strong enough to machine, and stronger if possible.

Moldability: Must be adaptable to isostatic pressing conditions.

After investigation of various materials such as epoxys, a high temperature silicon phenolic and exon it was found that DATB could be not pressed at 110 C and 20,000 psi to an acceptable density and strength. While a plastic binder is not needed for reasons of strength or desensitization it may however be needed as a plasticizer to resist thermal shock. This can only be determined by the production of larger specimens at Site 300. See Table I for summarized data.

Epoxy Binders: Epon 828 with 30% Versamide 125, when wet ball milled into the DATB in amounts of 3 or 5% gave a material which was thermally stable and with a good density and compressive strength when pressed in the hydraulic press. However when the conditions of the isostatic press were mocked up it became apparent that due to the thermosetting nature of this binder, it would be only with some difficulty that this binder could be used.

Exon 461 : This material can be ball milled dry into the DATB and gives a high strength, high density material, which could be adapted to the isostatic press. However it contains 40% chlorine and might not be acceptable in all cases where it is desired to employ DATB.

Hot Pressing of DATB: Initially it was assumed that the particle size distribution was a major problem in pressing DATB. This was indicated by the low bulk density, the low density of cold pressed specimens, and the increase

SUBJECT: Progress Report - Bonding of DATB

in density with increasing length of time of ball milling in the epoxy system.

After successfully pressing ball milled DATB at 110°C it was found that normal DATB (fine powder) could also be hot pressed at this temperature and at 20,000 psi.

Bulk Density of DATB Powder:

Fine powder as received	.47 gms/cc
" " " "	.61 gms/cc (when shaken down)
Coarse powder ground 2 hours	.62 gms/cc
Cold pressed and reground	.84 gms/cc (when shaken down)

It should be noted that bulk density might vary from batch to batch.

Attached: Table I.

cc: Gus Dorough.

FBA/jg

TABLE I - PRESSING OF DATA

No.	Binder	%	Cure Conditions				Density gm/cc	% Theo. Density	Comp. Strength
			Time Min.	Temp. °C.	Pressing psi	Ejection Temp. °C			
1	Epon 828 Versamide	3	10	100°	20,000	60°	1.765	98%	10,000
2	"	"	"	"	"	"	1.67		5,000
3	Exon	5	1	130°	20,000	"	1.81	99%	10,000
4	none		cold pressed				1.55		
5	none		1	110°	20,000	"	1.78	97.4%	11,000
6	none		1	110°	60,000	"	1.80	99%	-

Note: All pressings were with vacuum.

No. 2 above: (epoxy binder) when powder was preheated 30 min. at 80°C to simulate isostatic pressing conditions.