

TABLE 1

Industrial Source Foundry	Casting Temperature	Mold Temperature	Heat-Treatment	UTS Ksi	YS Ksi	Percent Elong.	Percent R.A.
A	~1510°C (air)	~1095°C (air)	None	117	72	7.6	8.8
			4 hr at 815°C	155	73	22	26
			4 hr at 1225°C				
B	~1480°C (air)	~990°C (air)	None	121	78	8.5	9.2
			4 hr at 815°C	164	82	23	24
			4 hr at 1225°C				
C	~1480°C (<i>in vacuo</i>)	~990°C (<i>in vacuo</i>)	None	123	69	11	13
			4 hrs at 815°C	166	72	26	26
			4 hr at 1225°C				
D	~1430°C (CLA process)	~870°C (<i>vacuum</i> injection)	None	121	89	15	15
			4 hrs at 815°C	178	82	27	26
			4 hrs at 1225°C				
ASTM Spec. F-75-67			As cast	96	65	8	8

Tensile properties of as-cast and heat-treated specimens of the Co-Cr prosthesis casting alloy produced by industrial foundries A, B, C, and D. All of ASTM F-75-67 specified composition.

Table 2.
Typical Mechanical Properties of Orthopaedic Alloys
 (Strength values in N/mm^2)

	<u>316L</u> <u>(ann.)</u>	<u>316L</u> <u>(C.W.)</u>	<u>Cast</u> <u>Co-Cr-Mo</u>	<u>Ti-6Al-4V</u>	<u>MP35N</u> <u>(forged)</u>	<u>H.I.P.</u> <u>Co-Cr-Mo</u>
Yield Strength	240	758	515	895	965	840
Ultimate Strength	505	965	725	965	1205	1275
Elongation	45%	22%	9%	10%	25%	14%
Fatigue Strength*	175	310	290	480	515+	765

* rectangular cross-section bending specimens, $R = -1$, 30Hz, laboratory air, 10^7 endurance limit

+ rotating bending specimens (Semlitch, 1976)

Table 1

Oxide Composition of High Aluminum Oxide Material

<u>Oxide</u>	<u>Weight Percent</u>
Alpha Al_2O_3	96
SiO_2	2.7
MgO	1.0
CaO	0.2
Na_2O	0.1

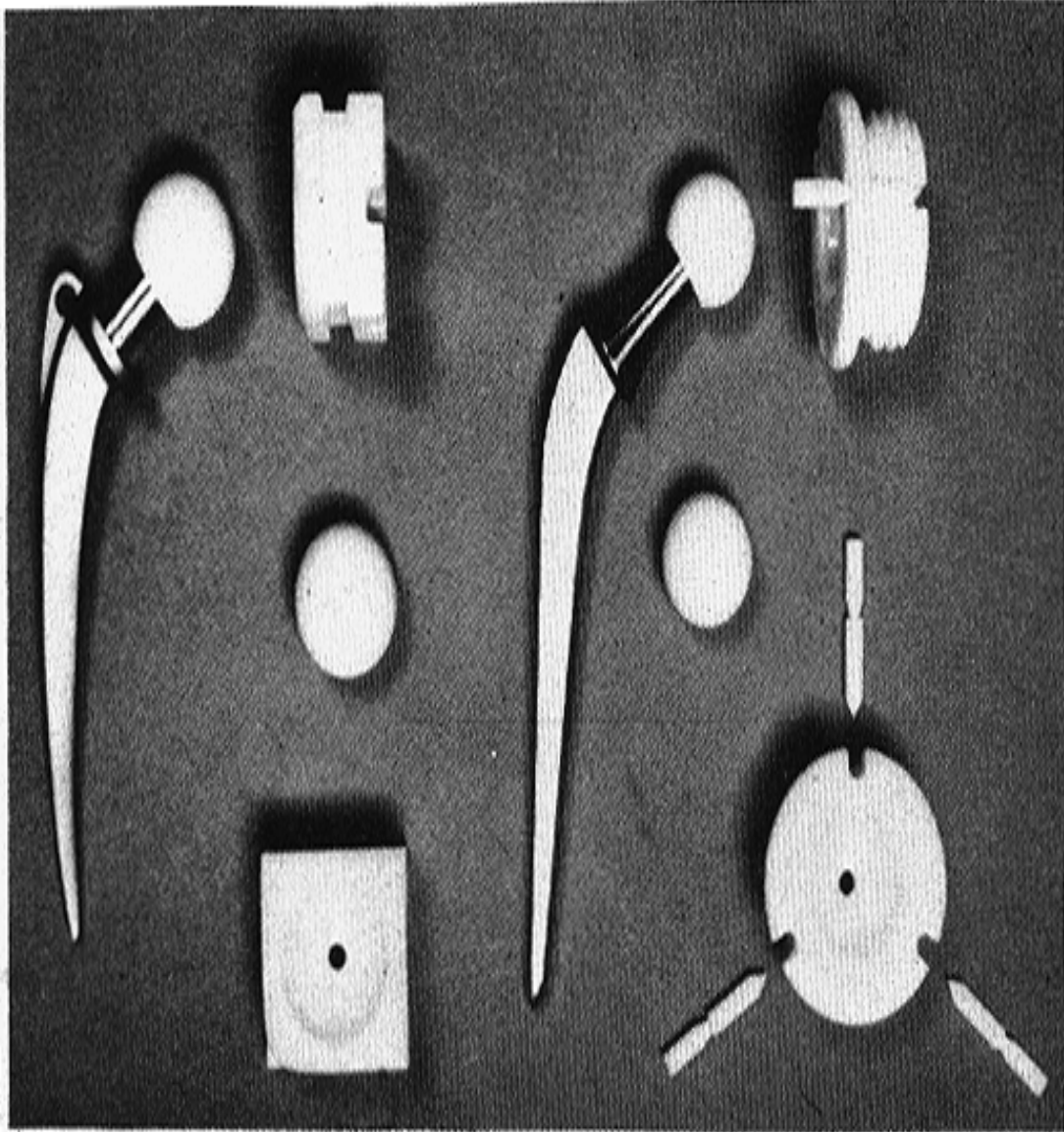


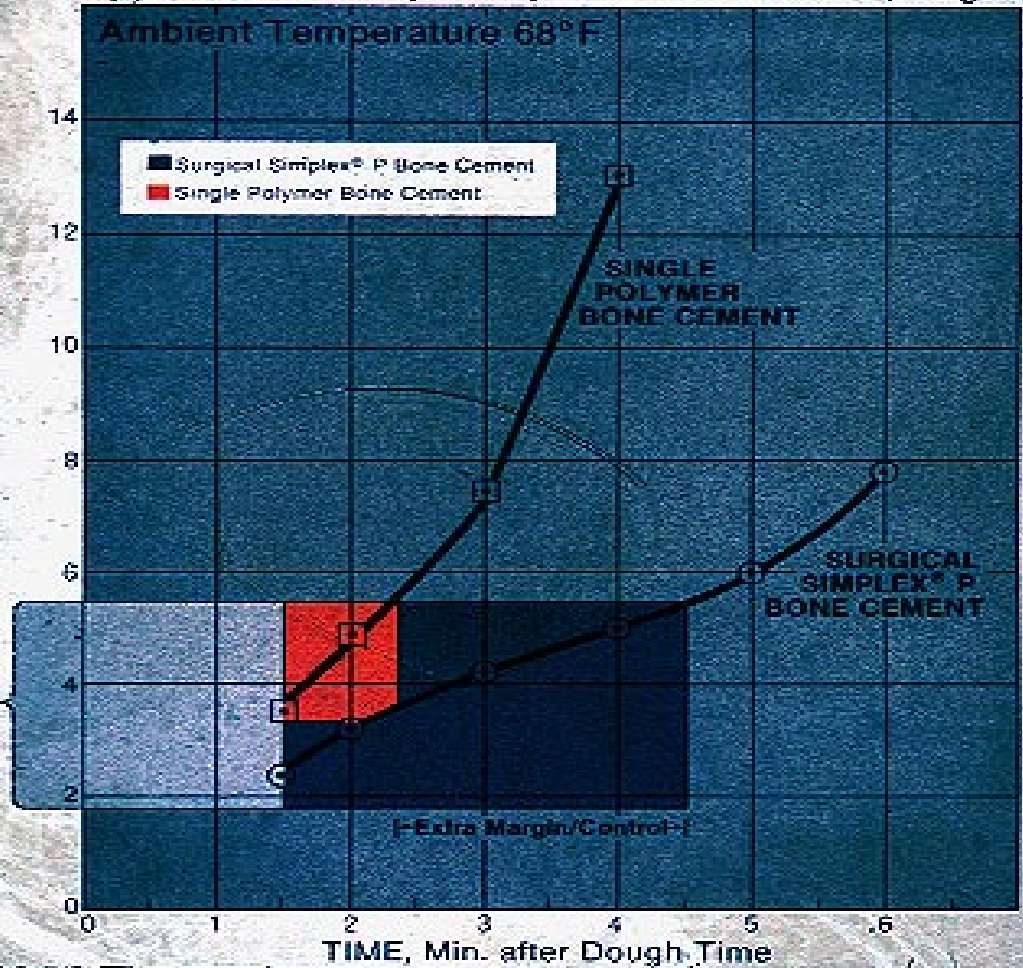
Fig. 1. Ceramic-metal composite prosthesis. Frialit total hip prosthesis, Mark Lindenhof, right, and Mark Friedrichsfeld, left.

Apparent Viscosity Comparison of Cement Doughs

Ambient Temperature 68°F

Apparent Viscosity, Poises x 10³

Suggested Range for Optimum Mechanical Interlock



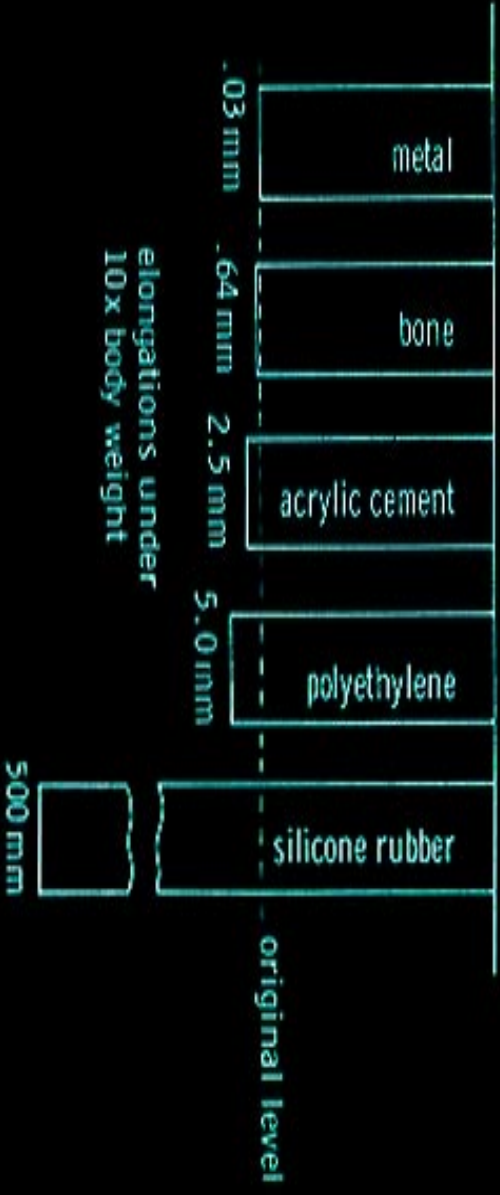


Table 3

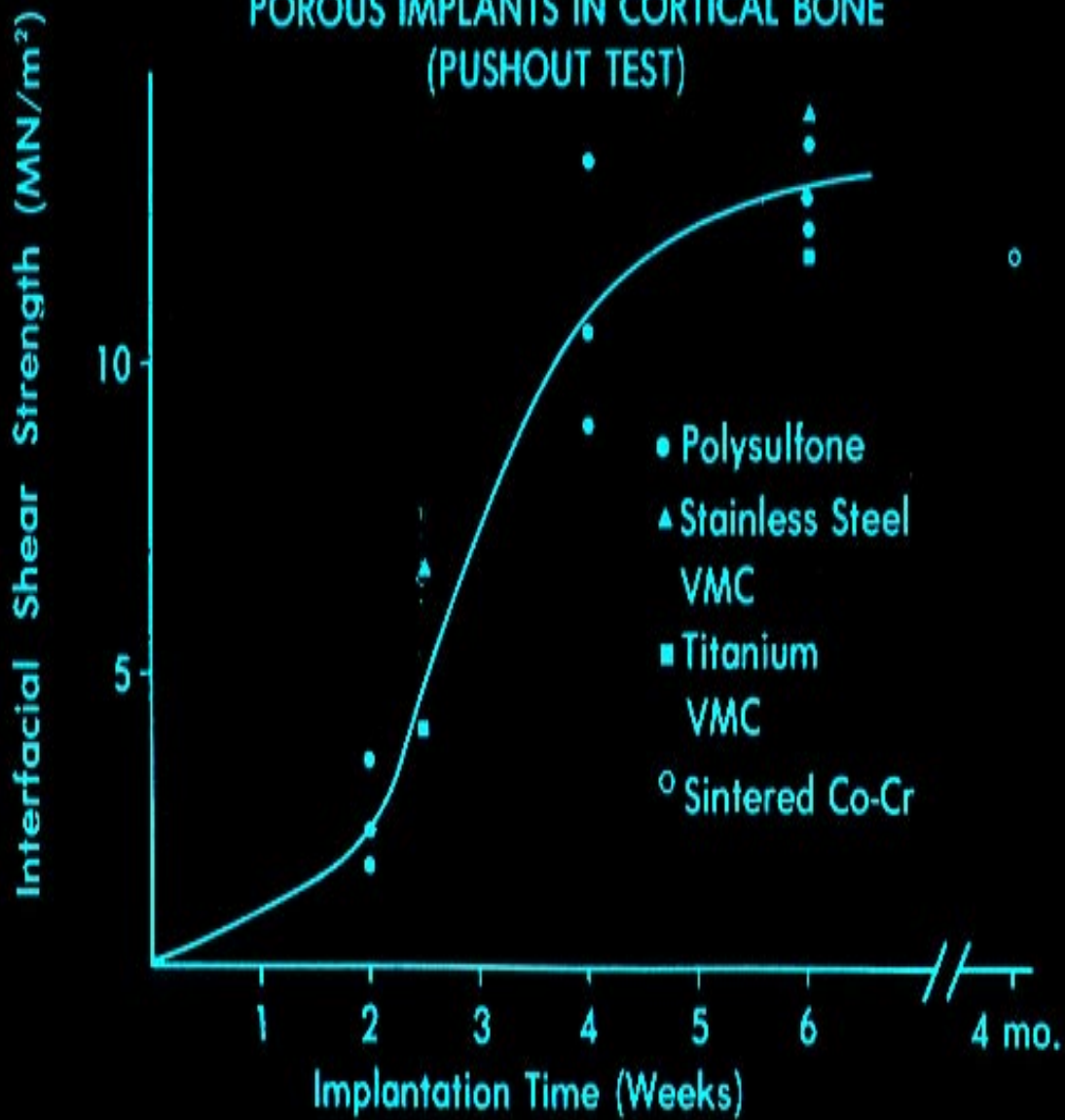
Interfacial Shear Strengths

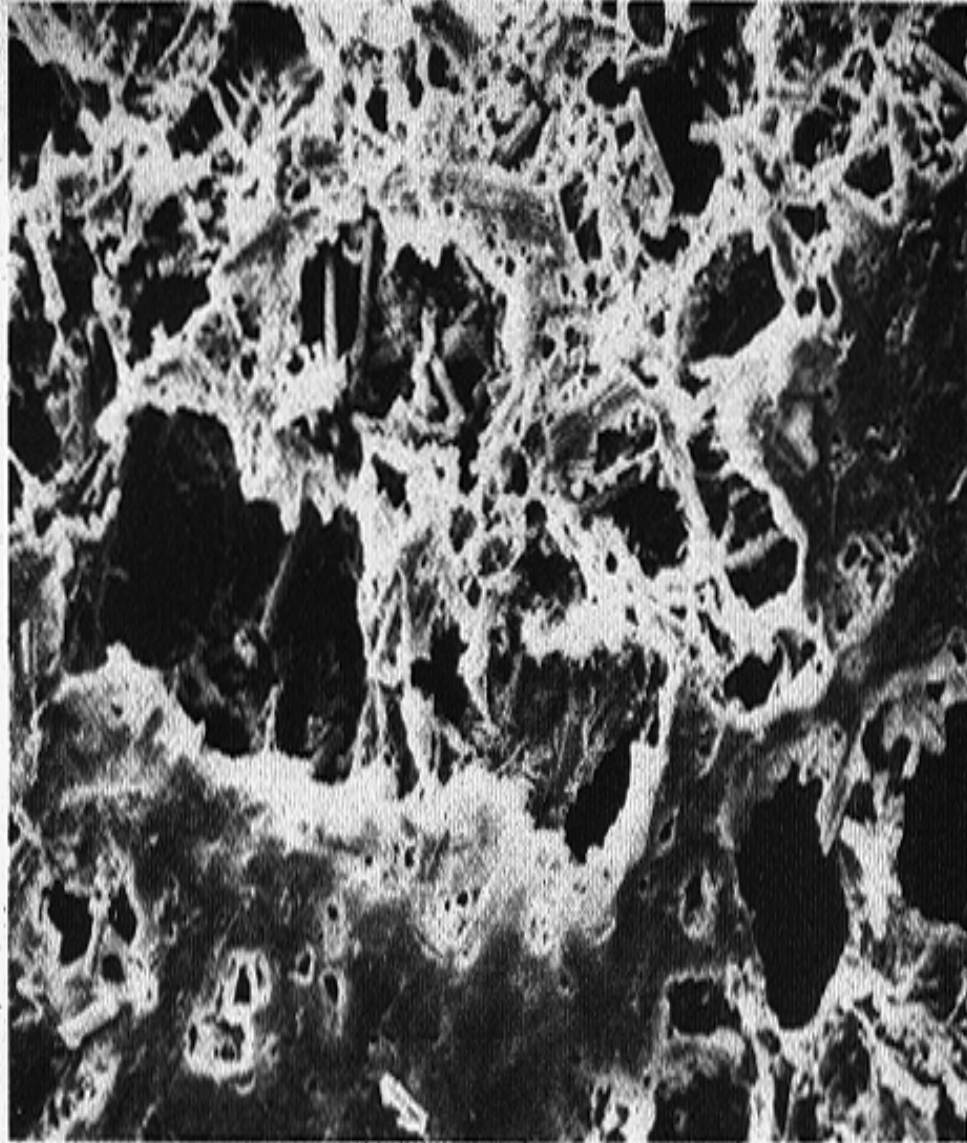
MATERIAL	IMPLANT TIME (WKS)	NUMBER OF SPECIMENS TESTED	TYPE OF BONE ADJACENT TO IMPLANT	INTERFACIAL SHEAR STRESS (psi)
HDPE	2	1	Cortical Cancellous	43
	4	1	" "	98
	8	1	" "	135
	16	1	" "	120
COBALT-CHROMIUM	4	2	Cancellous	1020
	4	2	Cortical	511
	8	2	Cancellous	1205
	8	2	Cortical	579
Alumina	8	4	Cancellous	444
	8	6	Cortical	665

TABLE 4. Transcortical (Varying) Density Plugs
(275- μ m Pore Size)

<u>Animal No.</u>	<u>Implant Time (mo)</u>	<u>Percent Theoretical Density</u>	<u>Plug Shear Area (in.²)</u>	<u>Push-out Force (lb)</u>	<u>Push-out Stress (psi)</u>
162	4	30	0.0505	187	3700
"	"	50	0.0409	90	2200
"	"	75	--	Negligible	--
158	18	30	0.0763	313	4102
"	"	50	"	275	3604
"	"	75	"	130	1703

POROUS IMPLANTS IN CORTICAL BONE (PUSHOUT TEST)





Scanning electron micrograph (100x) shows the highly porous structure of Proplast. This open pore configuration allows for thorough tissue ingrowth.