Lab Report No: Appx. A

CS50P - MICROMECHANICS LAB

Date: 2024-06-19

Test performed by:	Test certified by:
Name:	Name:
Data:	Date:

HALPIN-TSAI MICROMECHANICS ANALYSIS

UD Composite: FIBERGLASS-EPOXY

Table 1: Constituent's elastic properties

Constituent	Young's Modulus, E (GPa)	Poisson's Ratio, v	Shear Modulus, G (GPa)	Plane-strain Bulk Modulus, K (GPa)
Fiberglass	120.000	0.290	46.512	110.742
Epoxy	2.800	0.300	1.077	2.692

HALPIN-TSAI MICROMECHANICS ANALYSIS

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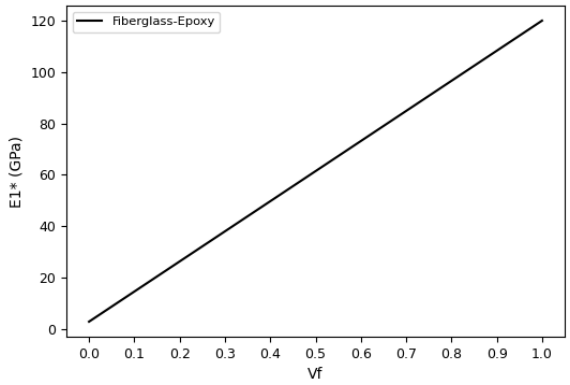
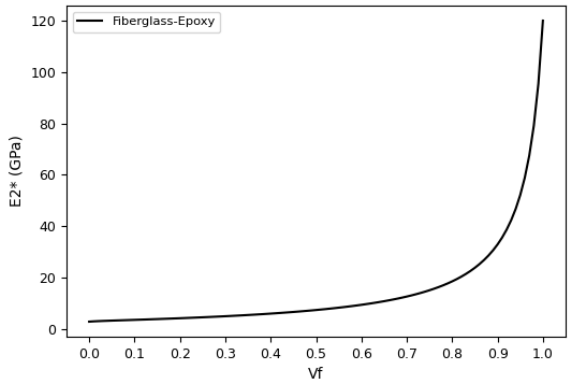
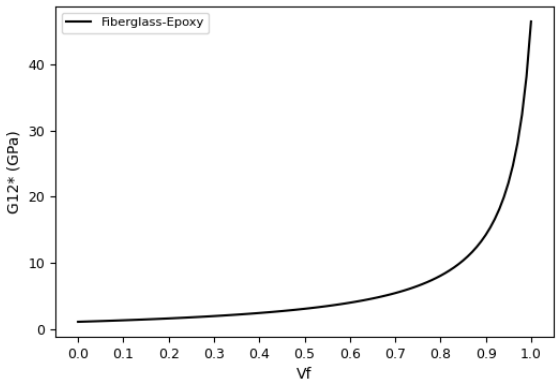


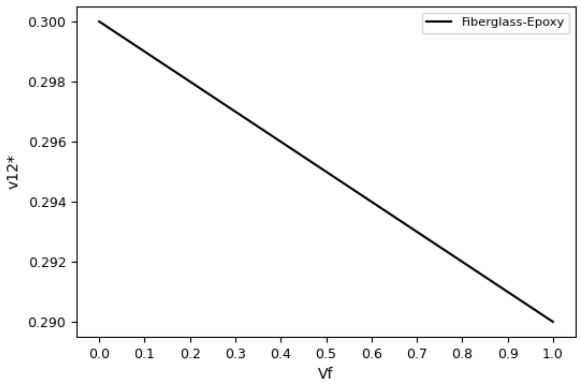
a) Effective axial Young's modulus



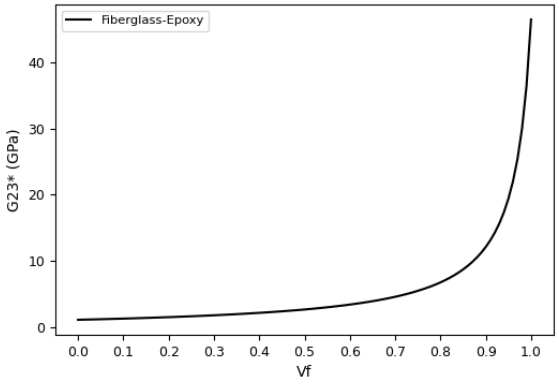
b) Effective transverse Young's modulus



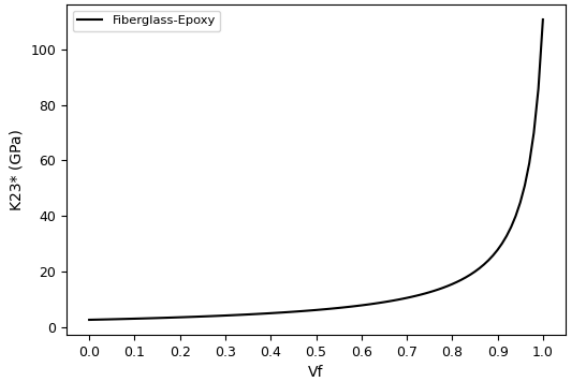
c) Effective axial shear modulus



d) Effective major Poisson's ratio



e) Effective transverse shear modulus



f) Effective plane-strain bulk modulus

Figure 1: Fiberglass-Epoxy composite - Effective elastic properties

HALPIN-TSAI MICROMECHANICS ANALYSIS

Table 2: Fiberglass-Epoxy composite - Effective elastic properties

Vf	E1* (GPa)	E2* (GPa)	G12* (GPa)	v12*	G23* (GPa)	K23* (GPa)
0	2.800	2.800	1.077	0.3000	1.077	2.692
0.01	3.972	2.916	1.098	0.2999	1.093	2.729
0.02	5.144	3.002	1.119	0.2998	1.110	2.766
0.03	6.316	3.075	1.141	0.2997	1.127	2.805
0.04	7.488	3.140	1.163	0.2996	1.144	2.844
0.05	8.660	3.203	1.185	0.2995	1.162	2.883
0.06	9.832	3.263	1.208	0.2994	1.180	2.924
0.07	11.004	3.321	1.231	0.2993	1.198	2.965
0.08	12.176	3.380	1.255	0.2992	1.217	3.008
0.09	13.348	3.438	1.279	0.2991	1.236	3.051
0.1	14.520	3.497	1.304	0.2990	1.256	3.095
0.11	15.692	3.556	1.330	0.2989	1.276	3.140
0.12	16.864	3.614	1.356	0.2988	1.296	3.186
0.13	18.036	3.675	1.382	0.2987	1.317	3.233
0.14	19.208	3.738	1.409	0.2986	1.339	3.282
0.15	20.380	3.799	1.437	0.2985	1.360	3.331
0.16	21.552	3.863	1.465	0.2984	1.383	3.381
0.17	22.724	3.929	1.494	0.2983	1.406	3.433
0.18	23.896	3.994	1.524	0.2982	1.429	3.486
0.19	25.068	4.061	1.554	0.2981	1.453	3.540
0.2	26.240	4.129	1.585	0.2980	1.477	3.595
0.21	27.412	4.199	1.617	0.2979	1.502	3.652
0.22	28.584	4.272	1.650	0.2978	1.528	3.710
0.23	29.756	4.346	1.683	0.2977	1.555	3.769
0.24	30.928	4.422	1.717	0.2976	1.582	3.830
0.25	32.100	4.497	1.752	0.2975	1.609	3.892
0.26	33.272	4.577	1.788	0.2974	1.638	3.957
0.27	34.444	4.658	1.825	0.2973	1.667	4.022
0.28	35.616	4.741	1.863	0.2972	1.697	4.090
0.29	36.788	4.825	1.902	0.2971	1.727	4.159
0.3	37.960	4.913	1.942	0.2970	1.759	4.231
0.31	39.132	5.002	1.983	0.2969	1.791	4.304
0.32	40.304	5.095	2.025	0.2968	1.825	4.379
0.33	41.476	5.190	2.068	0.2967	1.859	4.457
0.34	42.648	5.286	2.112	0.2966	1.894	4.536
0.35	43.820	5.388	2.158	0.2965	1.931	4.618
0.36	44.992	5.490	2.205	0.2964	1.968	4.702
0.37	46.164	5.595	2.254	0.2963	2.006	4.789
0.38	47.336	5.705	2.303	0.2962	2.046	4.879
0.39	48.508	5.818	2.355	0.2961	2.087	4.971
0.4	49.680	5.934	2.408	0.2960	2.129	5.067
0.41	50.852	6.054	2.463	0.2959	2.173	5.165
0.42	52.024	6.178	2.519	0.2958	2.218	5.266
0.43	53.196	6.305	2.577	0.2957	2.264	5.371

HALPIN-TSAI MICROMECHANICS ANALYSIS

Vf	E1* (GPa)	E2* (GPa)	G12* (GPa)	v12*	G23* (GPa)	K23* (GPa)
0.44	54.368	6.437	2.637	0.2956	2.312	5.480
0.45	55.540	6.574	2.700	0.2955	2.362	5.592
0.46	56.712	6.714	2.764	0.2954	2.413	5.708
0.47	57.884	6.860	2.830	0.2953	2.466	5.828
0.48	59.056	7.010	2.899	0.2952	2.521	5.952
0.49	60.228	7.167	2.971	0.2951	2.578	6.081
0.5	61.400	7.329	3.044	0.2950	2.637	6.215
0.51	62.572	7.498	3.121	0.2949	2.699	6.354
0.52	63.744	7.672	3.201	0.2948	2.762	6.498
0.53	64.916	7.855	3.283	0.2947	2.829	6.649
0.54	66.088	8.044	3.369	0.2946	2.898	6.805
0.55	67.260	8.241	3.459	0.2945	2.970	6.967
0.56	68.432	8.444	3.552	0.2944	3.044	7.137
0.57	69.604	8.657	3.649	0.2943	3.122	7.313
0.58	70.776	8.882	3.750	0.2942	3.204	7.498
0.59	71.948	9.114	3.855	0.2941	3.289	7.690
0.6	73.120	9.357	3.966	0.2940	3.378	7.892
0.61	74.292	9.612	4.081	0.2939	3.471	8.103
0.62	75.464	9.879	4.202	0.2938	3.569	8.324
0.63	76.636	10.158	4.328	0.2937	3.671	8.557
0.64	77.808	10.453	4.461	0.2936	3.779	8.801
0.65	78.980	10.761	4.600	0.2935	3.892	9.057
0.66	80.152	11.086	4.747	0.2934	4.011	9.328
0.67	81.324	11.427	4.901	0.2933	4.136	9.613
0.68	82.496	11.790	5.064	0.2932	4.269	9.914
0.69	83.668	12.171	5.235	0.2931	4.409	10.233
0.7	84.840	12.577	5.417	0.2930	4.558	10.570
0.71	86.012	13.007	5.610	0.2929	4.716	10.929
0.72	87.184	13.463	5.814	0.2928	4.884	11.310
0.73	88.356	13.948	6.031	0.2927	5.062	11.716
0.74	89.528	14.467	6.262	0.2926	5.253	12.150
0.75	90.700	15.021	6.509	0.2925	5.457	12.615
0.76	91.872	15.615	6.773	0.2924	5.676	13.113
0.77	93.044	16.252	7.056	0.2923	5.911	13.648
0.78	94.216	16.938	7.360	0.2922	6.164	14.226
0.79	95.388	17.680	7.688	0.2921	6.438	14.851
0.8	96.560	18.484	8.042	0.2920	6.735	15.529
0.81	97.732	19.357	8.426	0.2919	7.058	16.268
0.82	98.904	20.310	8.844	0.2918	7.411	17.075
0.83	100.076	21.354	9.300	0.2917	7.798	17.961
0.84	101.248	22.504	9.801	0.2916	8.225	18.938
0.85	102.420	23.774	10.352	0.2915	8.697	20.020
0.86	103.592	25.186	10.962	0.2914	9.223	21.226
0.87	104.764	26.764	11.640	0.2913	9.811	22.579
0.88	105.936	28.541	12.400	0.2912	10.475	24.106
0.89	107.108	30.555	13.256	0.2911	11.229	25.845

HALPIN-TSAI MICROMECHANICS ANALYSIS

Vf	E1* (GPa)	E2* (GPa)	G12* (GPa)	v12*	G23* (GPa)	K23* (GPa)
0.9	108.280	32.857	14.228	0.2910	12.093	27.841
0.91	109.452	35.514	15.342	0.2909	13.093	30.156
0.92	110.624	38.618	16.631	0.2908	14.265	32.875
0.93	111.796	42.287	18.139	0.2907	15.655	36.112
0.94	112.968	46.694	19.928	0.2906	17.333	40.032
0.95	114.140	52.086	22.084	0.2905	19.397	44.875
0.96	115.312	58.834	24.734	0.2904	21.998	51.011
0.97	116.484	67.525	28.069	0.2903	25.377	59.039
0.98	117.656	79.138	32.392	0.2902	29.945	69.993
0.99	118.828	95.441	38.222	0.2901	36.461	85.828
1	120.000	120.001	46.512	0.2900	46.512	110.742