

April 27, 2022

Series 8: Doehlert designs

1 Surface energy in a thin layer on a disk of silicium

Table 1 reproduces data of a set of experiments related to the deposit of a thin layer on a disk of silicon.

1. Realize a *scatter plot* of the variables two by two to visualizer the geometry of the design.
2. Built a model matrix for a quadratic model
3. Infer the coefficients
4. Identify the significant effects
5. Perform an ANOVA
6. Perform a canonical analysis

Table 1: Data

	C_2H_2 [sccm]	CO_2 [sccm]	Pressure [μbar]	Power [w]	Surface energy [mN/m]
min	10	10	5	100	
max	30	16	35	200	
I	x_1	x_2	x_3	x_4	y
1	0	0	0	0	51.74
2	-1	0	0	0	51.46
3	1	0	0	0	51.22
4	-0.5	-0.866	0	0	51.72
5	0.5	0.866	0	0	46.07
6	-0.5	0.866	0	0	45.89
7	0.5	-0.866	0	0	51.72
8	-0.5	-0.2887	-0.8165	0	52.33
9	0.5	0.2887	0.8165	0	45.83
10	-0.5	0.2887	0.8165	0	48.83
11	0	-0.5774	0.8165	0	49.90
12	0.5	-0.2887	-0.8165	0	55.76
13	0	0.5774	-0.8165	0	49.27
14	-0.5	-0.2887	-0.2041	-0.7906	49.48
15	0.5	0.2887	0.2041	0.7906	46.35
16	-0.5	0.2887	0.2041	0.7906	46.19
17	0	-0.5774	0.2041	0.7906	48.83
18	0	0	-0.6124	0.7906	47.95
19	0.5	-0.2887	-0.2041	-0.7906	48.18
20	0	0.5774	-0.2041	-0.7906	46.04
21	0	0	0.6124	-0.7906	44.30