

PRISMS-CPFE

Simple Tension -BCC Titanium

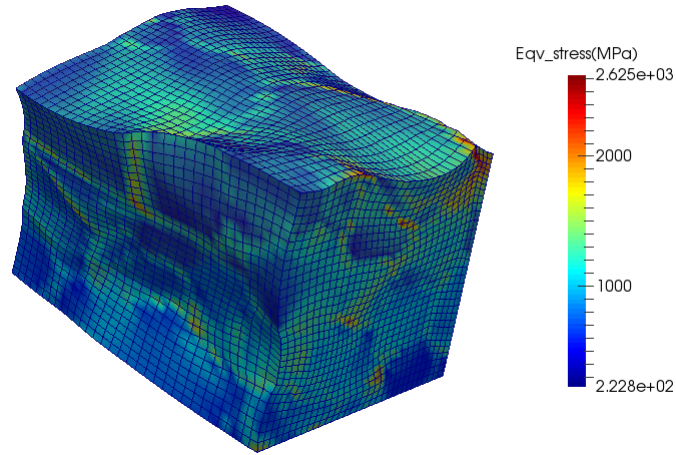


Figure 1: Equivalent Von-Mises Stress shown on a magnified(x3) deformation field

This is an illustrative example of a simple Tension deformation problem. A virtual bcc microstructure was tested with the material parameters of β Titanium which were obtained from [1]

Input Crystal Parameters

```
//Latent Hardening Ratio
problem.properties.q1=1.4;
problem.properties.q2=1.0;
//Slip Hardening Parameters
problem.properties.a=1.0;
problem.properties.h0=1500; //MPa
problem.properties.s_s=500; //MPa
//Initial slip deformation resistance
problem.properties.s0=200;
//Elastic Parameters
problem.properties.C11=97.7e3; //MPa
problem.properties.C12=82.7e3; //MPa
problem.properties.C44=37.5e3; //MPa
//reading microstructure data files
unsigned int numPts[3]={68, 64, 46}; // No. of voxels in x,y and z
directions
```

The slip systems of BCC Titanium are as follows

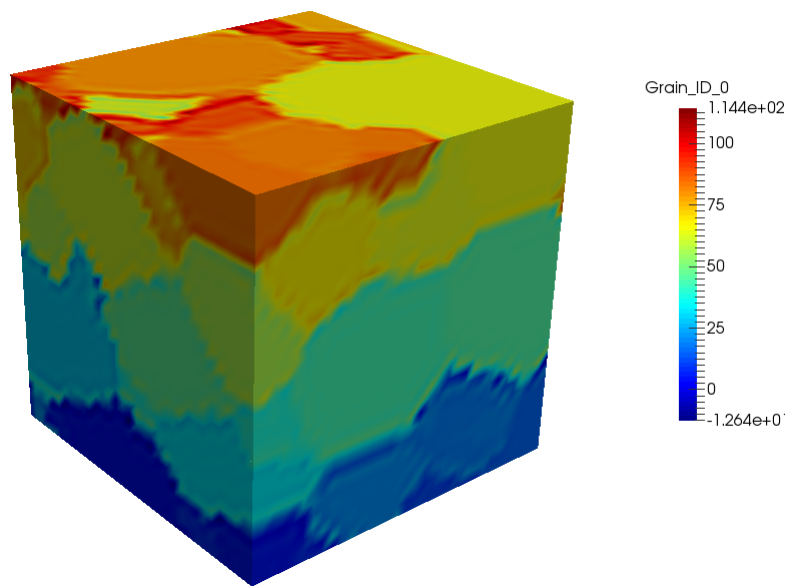


Figure 2: Virtual input microstructure

Table 1: Table Title

System Number	Slip Direction	Slip Plane
1	[1 -1 1]	(0 1 1)
2	[1 1 -1]	(0 1 1)
3	[-1 1 1]	(1 0 1)
4	[1 1 -1]	(1 0 1)
5	[-1 1 1]	(1 1 0)
6	[1 -1 1]	(1 1 0)
7	[1 1 1]	(0 -1 1)
8	[-1 1 1]	(0 -1 1)
9	[1 1 1]	(1 0 -1)
10	[1 -1 1]	(1 0 -1)
11	[1 1 1]	(-1 1 0)
12	[1 1 -1]	(-1 1 0)
13	[1 1 -1]	(1 1 2)
14	[1 -1 1]	(-1 1 2)
15	[-1 1 1]	(1 -1 2)
16	[1 1 1]	(1 1 -2)
17	[1 -1 1]	(1 2 1)
18	[1 1 -1]	(-1 2 1)
19	[1 1 1]	(1 -2 1)
20	[-1 1 1]	(1 2 -1)
21	[-1 1 1]	(2 1 1)
22	[1 1 1]	(-2 1 1)
23	[1 1 -1]	(2 -1 1)
24	[1 -1 1]	(2 1 -1)
25	[1 1 -1]	(1 2 3)
26	[1 -1 1]	(-1 2 3)
27	[-1 1 1]	(1 -2 3)
28	[1 1 1]	(1 2 -3)
29	[-1 1 1]	(3 1 2)
30	[1 1 1]	(-3 1 2)
31	[1 1 -1]	(3 -1 2)
32	[1 -1 1]	(3 1 -2)
33	[1 -1 1]	(2 3 1)
34	[1 1 -1]	(-2 3 1)
35	[1 1 1]	(2 -3 1)
36	[-1 1 1]	(2 3 -1)
37	[1 -1 1]	(1 3 2)
38	[1 1 -1]	(-1 3 2)
39	[1 1 1]	(1 -3 2)
40	[-1 1 1]	(1 3 -2)
41	[1 1 -1]	(2 1 3)
42	[1 -1 1]	(-2 1 3)
43	[-1 1 1]	(2 -1 3)
44	[1 1 1]	(2 1 -3)
45	[-1 1 1]	(3 2 1)
46	[1 1 1]	(-3 2 1)
47	[1 1 -1]	(3 -2 1)
48	[1 -1 1]	(3 2 -1)