The modelling of the laser cladding process was done in ANSYS. The tool powder was chosen to be H13 high speed steel and the size of the substrate was 5x5x7mm. The modelling was done using element birth technique wherein a semi-circular clad was chosen with a diameter of 1.2mm. Now, the substrate was divided into 4 equal parts to simulate the moving laser cladding process. A laser with a given power (100W) was focussed on the centre of those 4 parts for a time interval of 1 second each, i.e., the velocity of the laser was assumed to be known. Hence, the total simulation time was 4 seconds (1 second for each part). Hence, a good approximation of the transient thermal states can be obtained by assuming the clad to be divided into a large number of parts and then moving the laser on each one of them subsequently. The simulation was done for different powers of laser and the corresponding maximum and minimum temperature were obtained.

Major Assumptions in the model are:-

* Material is isotropic in nature.
* The flow function of molten pool fluid is neglected.
* Heat loss due to radiation is not accounted for in the model.
* Evaporation of the substrate and the powder is neglected.

Properties used:

Thermal conductivity (K) = 26.4W/mK

Specific heat capacity (Cp) = 490 W/kgK

Density (rho) = 7448 kg/m^3

Melting Temperature (Tm) = 1700 K

Convection coefficient (h) = 15 W/m^2K

Latent heat of fusion (L) = 320 KJ

The maximum and minimum temperatures obtained for different power inputs are tabulated below.

|  |  |  |
| --- | --- | --- |
| Power (W) | Max Temperature (C) | Min Temperature (C) |
| 100 | 1640 | 585 |
| 150 | 2447 | 866 |
| 175 | 2851 | 1007 |
| 200 | 3256 | 1148 |