

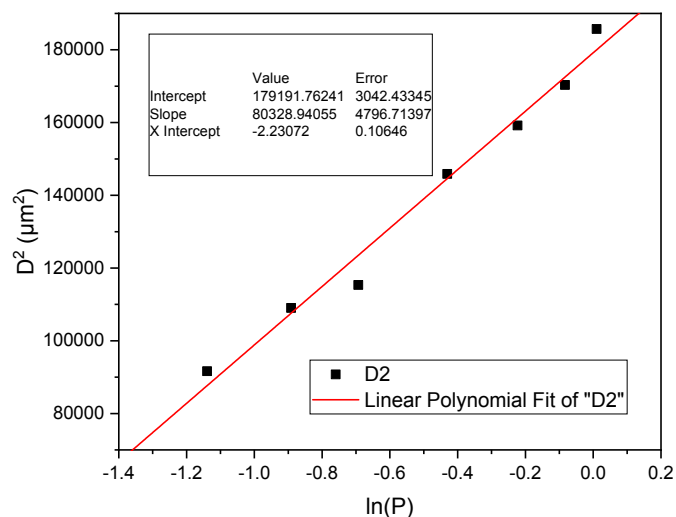


Fig S1. D^2 vs $\ln(P)$ for Co_2 laser scanning at 120 m/min and repetition rate 0.1 kHz.

Table S1. Calculation of beam diameter and threshold power for scanning laser:

x-intercept	Slope	ω_0^2 (μm^2)	ω_0 (μm)	P_{Th} (W)	F_{Th} (mJ/cm ²)	P (W)	f (Hz)	tp (μs)	ω_0 (m)	F (J/m ²)	F(mJ/cm ²)
-2.23072	80328.94	40164.47028	200.411	0.107451	1.70E+03	0.21	100	40	2.01E-04	3.31E+04	3313.989453
						0.32	100	50	2.01E-04	5.05E+04	5049.88869
						0.41	100	60	2.01E-04	6.47E+04	6470.169884
						0.5	100	70	2.01E-04	7.89E+04	7890.451078
						0.65	100	80	2.01E-04	1.03E+05	10257.5864
						0.8	100	90	2.01E-04	1.26E+05	12624.72173
						0.92	100	100	2.01E-04	1.45E+05	14518.42998

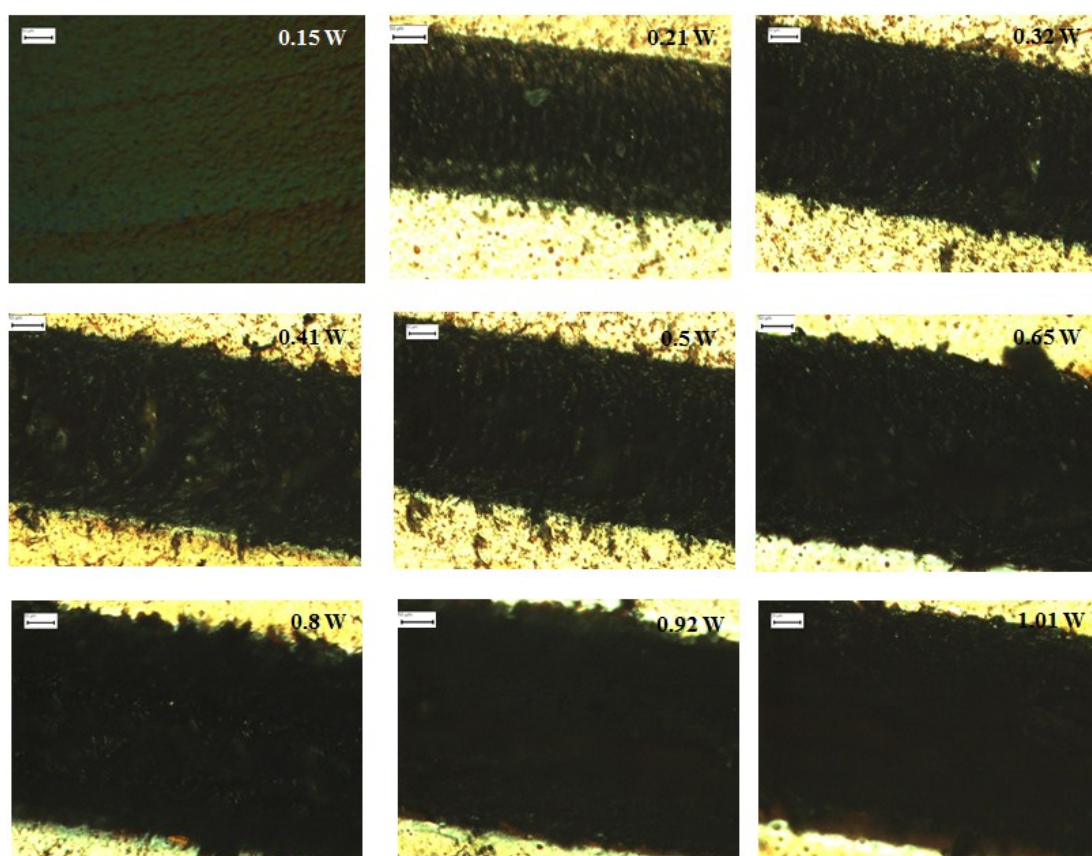


Fig S2. Microscopic images of Carbonized vias

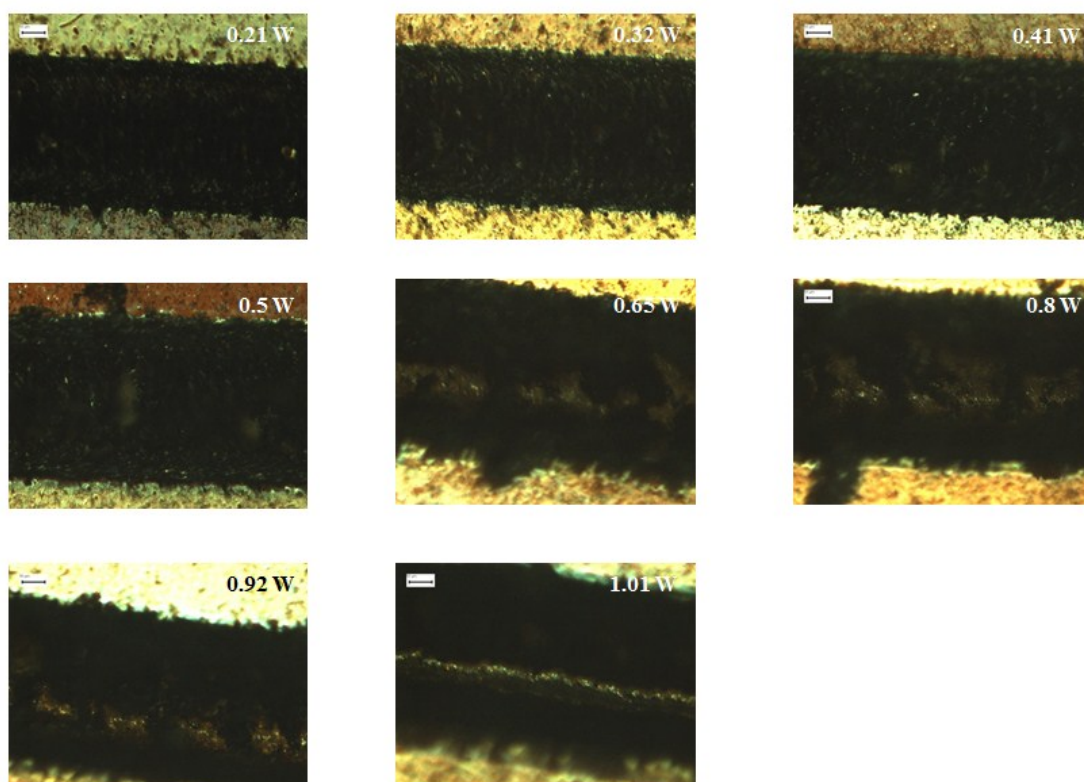


Fig S3. Microscopic images of Graphitized vias on pre-carbonized vias at 0.21 W

Table S2: Calculation of conductivity of carbonized and graphitized vias:

Carbonization										
l (mm)	d (um)	D (um)	Area of the segment	Power (W)	R (Ω)	Uncertainty (Ω)	Resistivity (Ω -m)	Uncertainty (Ω -m)	Conductivity (S/m)	Uncertainty (S/m)
10	39.8	280.6	7543.74638	0.21	23611.367	1301.213884	0.017811816	0.000981603	56.14250538	3.093993138
10	42.5	318.8	9132.753757	0.32	24072.425	496.7726495	0.021984753	0.00045369	45.4860694	0.938677147
10	46.1	334.7	10411.82387	0.41	17949.023	111.0241576	0.018688207	0.000115596	53.5096824	0.330985559
10	67.3	358.7	16511.14854	0.5	8560.1595	103.1088118	0.014133807	0.000170244	70.75234827	0.852226009
10	101	392.8	27770.70773	0.65	3588.6393	62.51409661	0.009965905	0.000173606	100.3421133	1.747959613
Graphitization										
l (mm)	d (μ m)	D (μ m)	Area of the segment	Power (W)	R (Ω)	Uncertainty (Ω)	Resistivity (Ω -m)	Uncertainty (Ω -m)	Conductivity (S/m)	Uncertainty (S/m)
10	38.9	307	8036.752213	0.21-0.21	16953.50597	75.42845772	0.013625113	6.062E-05	73.39388854	0.326539409
10	43	323.7	9381.127455	0.21-0.32	17767.08313	33.81258884	0.016667527	3.172E-05	59.99690247	0.114180284
10	48.8	333.3	10999.55653	0.21-0.41	8860.30686	8.938922204	0.009745945	9.83242E-06	102.6067805	0.103517185
10	68.5	348.6	16375.95539	0.21-0.5	4208.29672	126.4356092	0.006891488	0.00020705	145.1065444	4.359634208
10	90.1	365.2	22945.50266	0.21-0.65	2971.23264	104.0525671	0.006817643	0.000238754	146.6782658	5.136672869