

Electronic Supplementary Information

Creation of spherical carbon nanoparticles and clusters from carbon dioxide via UV dissociation at the critical point

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SEM Images

SEM images of the original substrates before laser irradiation experiment can be seen in Fig. S1-S4. The images of platinum substrate and aluminium/magnetite substrate after irradiation experiment are shown in Fig. S5 and S6, respectively.

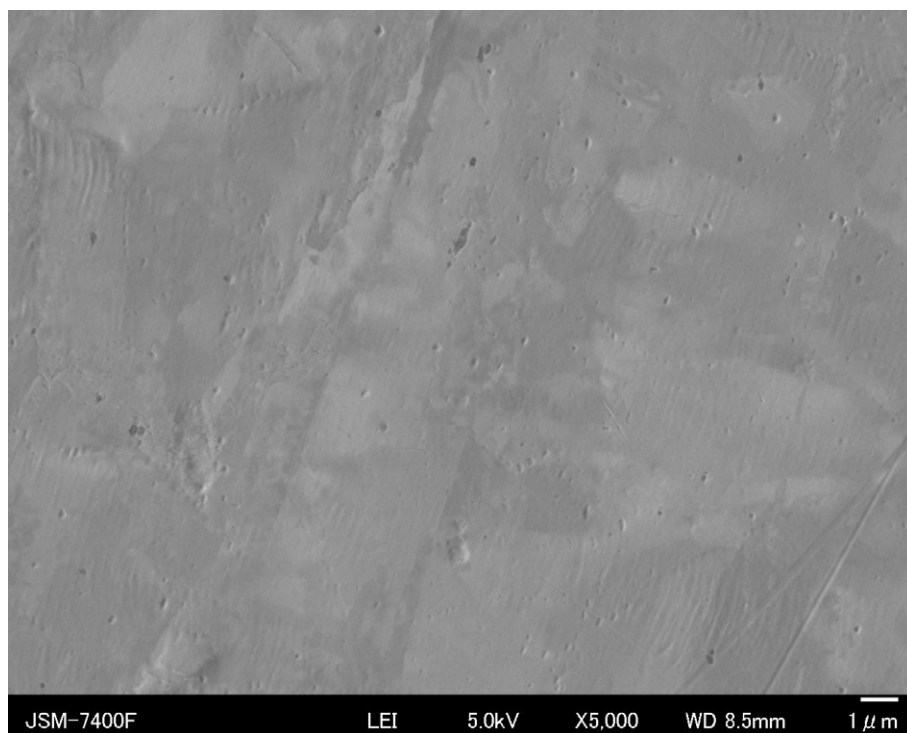


Fig. S1 SEM image of platinum substrate before experiment (magnification 5000x).

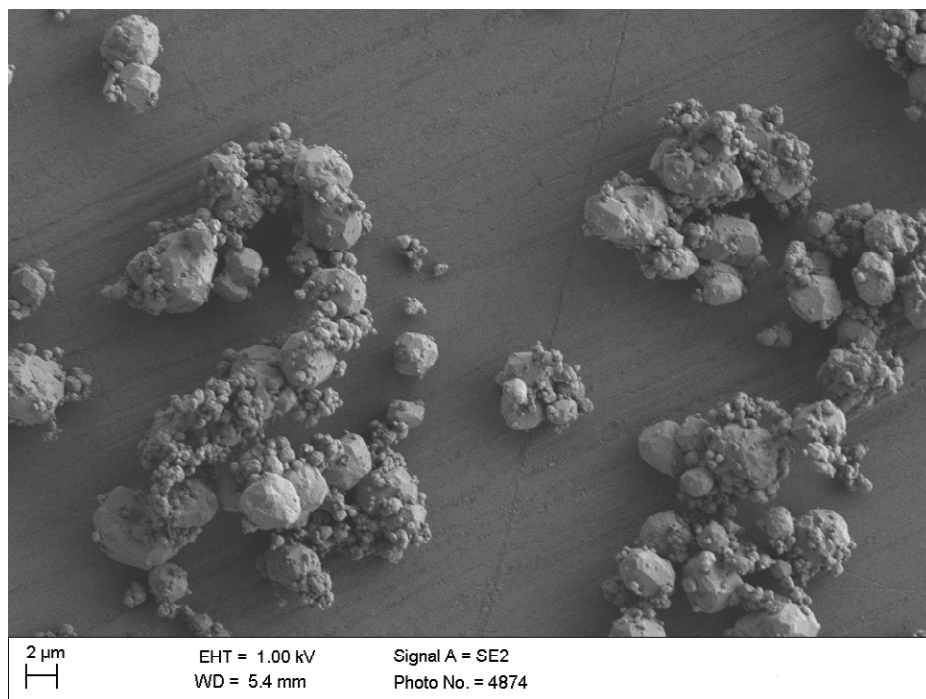


Fig. S2 SEM image of aluminium/copper substrate before experiment (magnification 5000x).

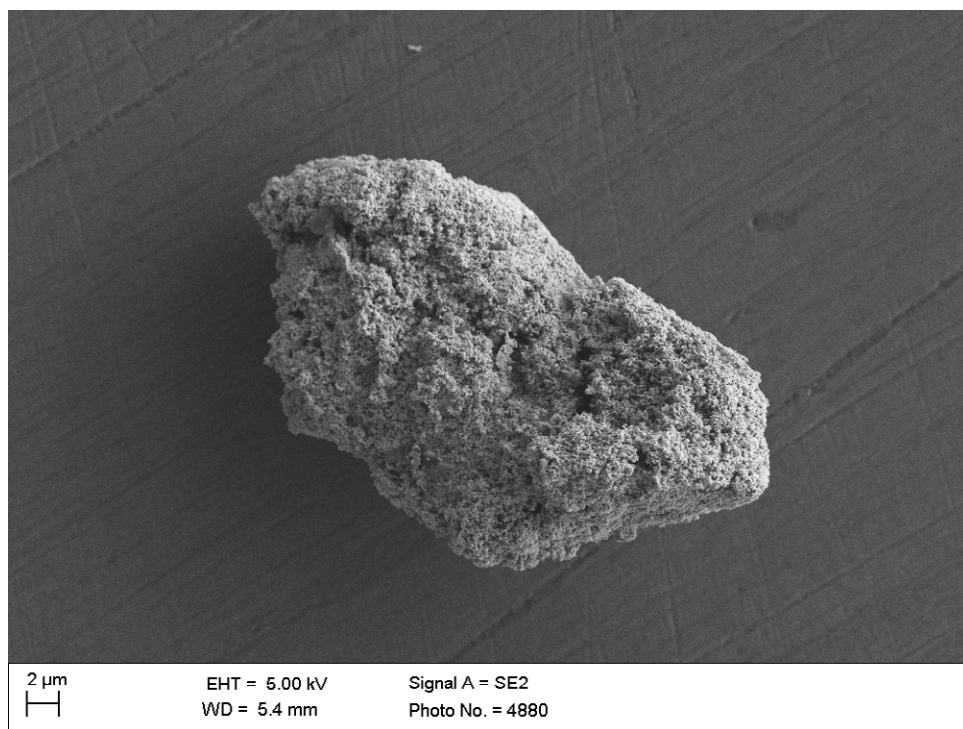


Fig. S3 SEM image of aluminium/gold substrate before experiment (magnification 5000x).

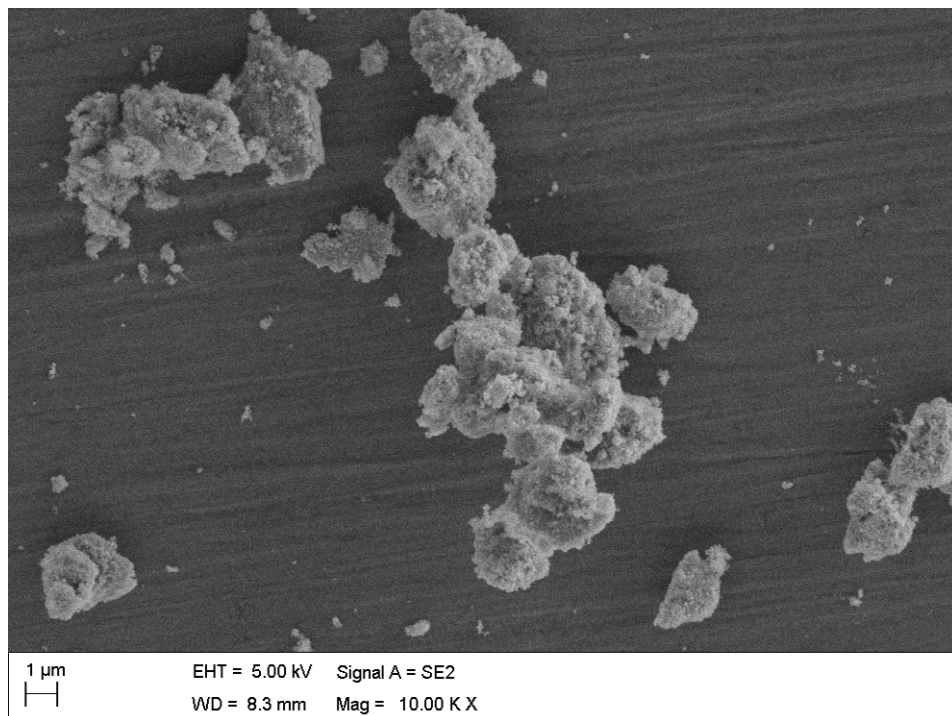


Fig. S4 SEM image of aluminium/magnetite substrate before experiment (magnification 10000x).

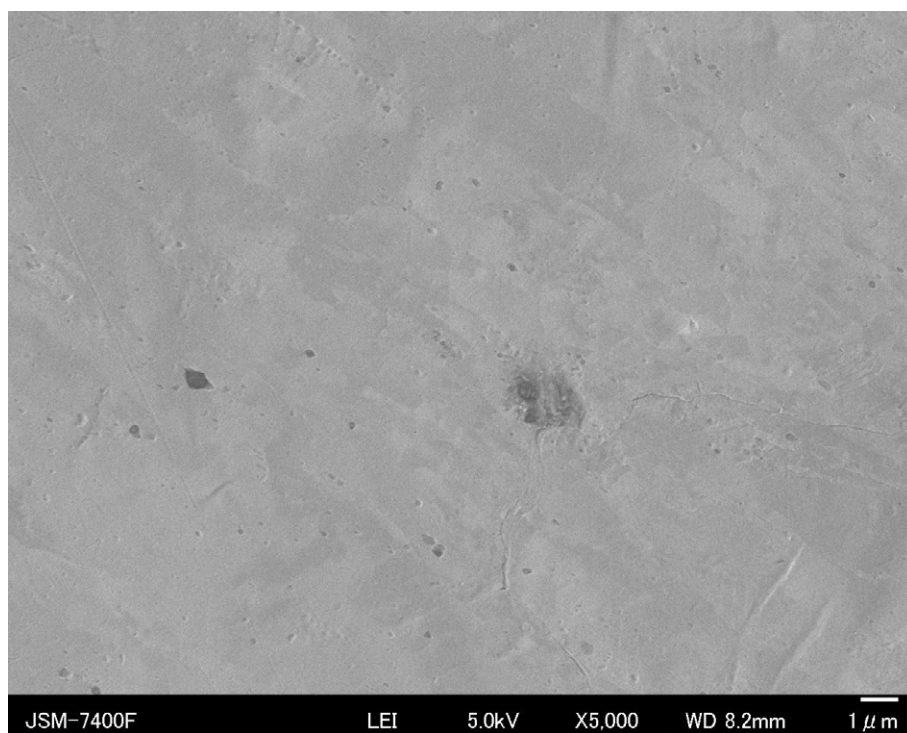


Fig. S5 SEM image of platinum substrate after laser irradiation experiment (magnification 5000x).

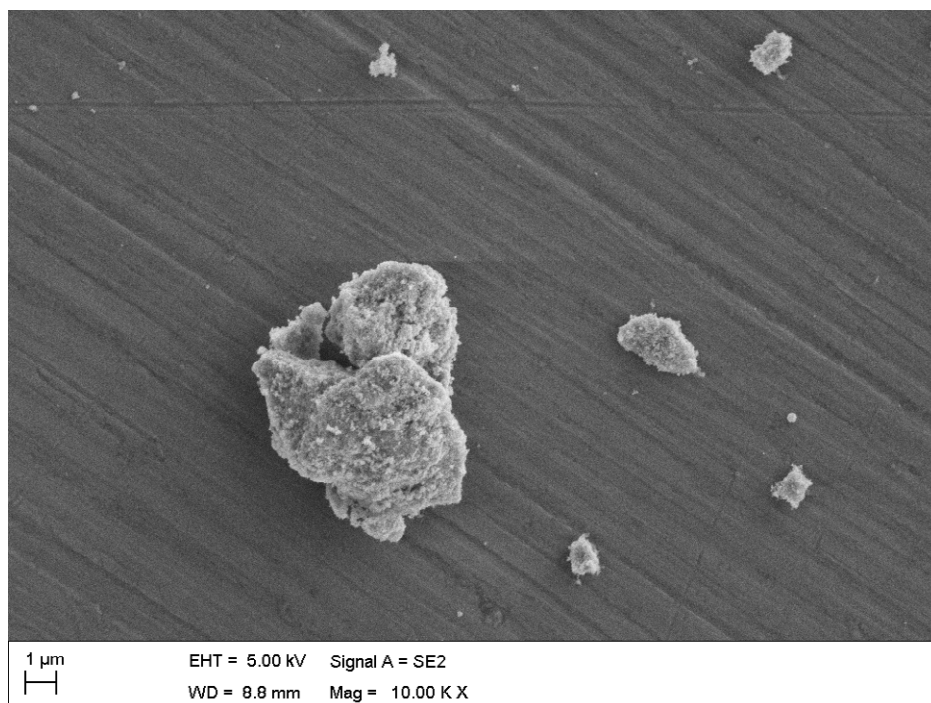


Fig. S6 SEM image of aluminium/magnetite substrate after laser irradiation experiment (magnification 10000x).

EDS analysis

EDS analysis revealed some oxidation of the aluminium surface after the experiment. The oxygen peak is clearly visible in Fig. S7.

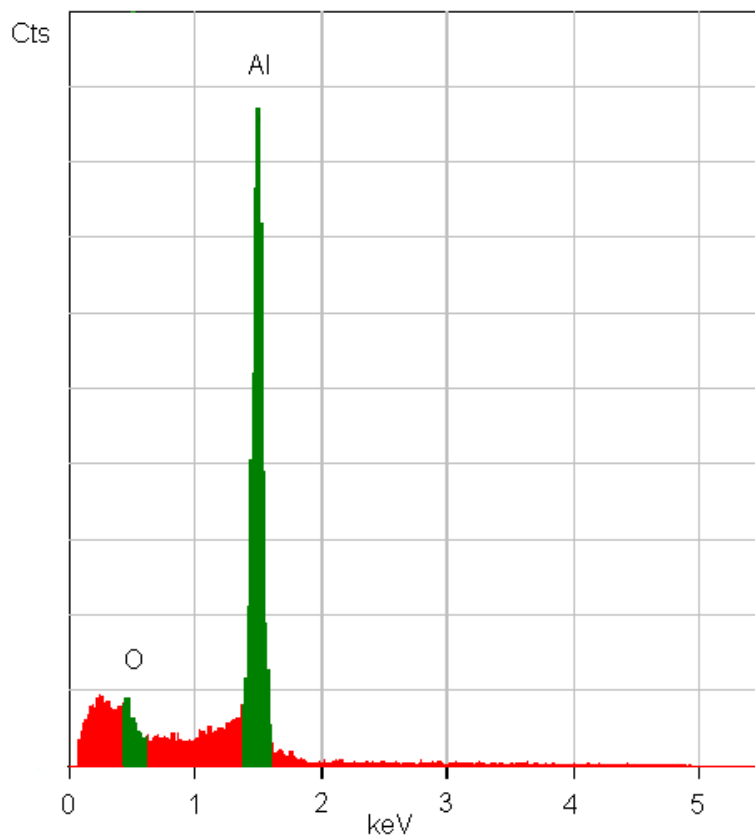


Fig. S7 EDS analysis of aluminium surface after laser irradiation experiment in carbon dioxide (substrate: copper on aluminium).

EDS analysis of the produced carbon particles on aluminium surface is shown in Fig. S8. The particles mainly consist of carbon with very small amount of impurities. The aluminium peak in the EDS spectrum arises from the aluminium substrate.

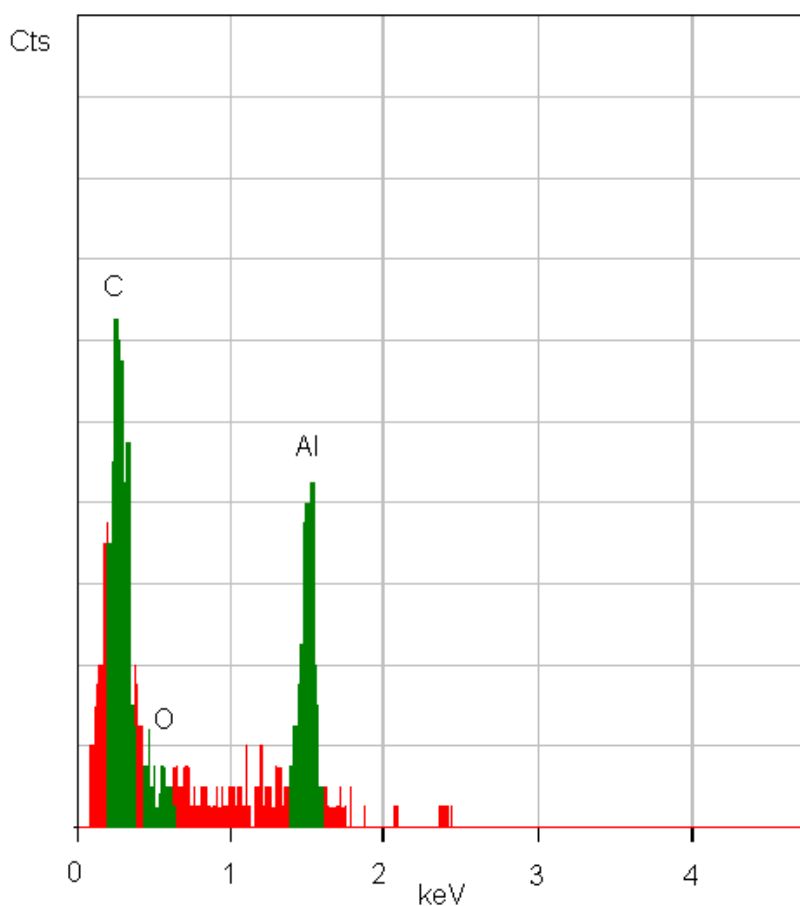


Fig. S8 EDS analysis of carbon particles on aluminium surface after laser irradiation experiment in carbon dioxide (substrate: gold on aluminium).

The EDS analysis of the aluminium/magnetite substrates before and after the laser irradiation experiment, respectively, are presented in Fig. S9 and Fig. S10. The aluminium peak arises from the aluminium substrate. It is obvious from Fig. S9 that the original magnetite sample already contained some carbon impurity. The amount of carbon was not increased after the experiment, as can be seen from Fig. S10 in comparison with Fig. S9, indicating there was no additional formation of carbon on the substrate during laser irradiation of carbon dioxide.

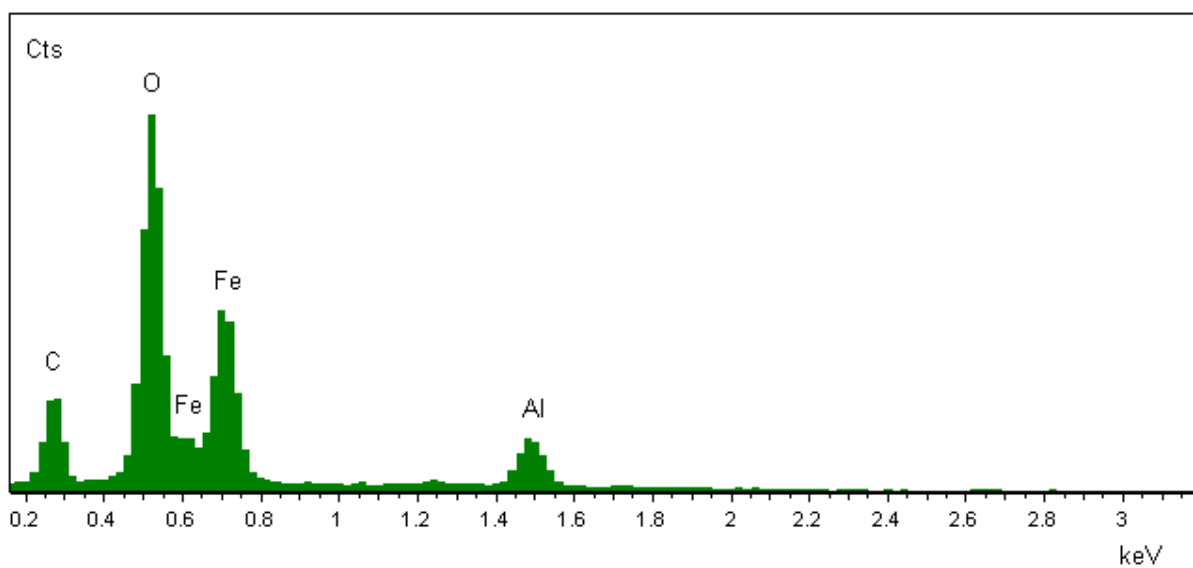


Fig. S9 EDS analysis of aluminium/magnetite substrate before experiment.

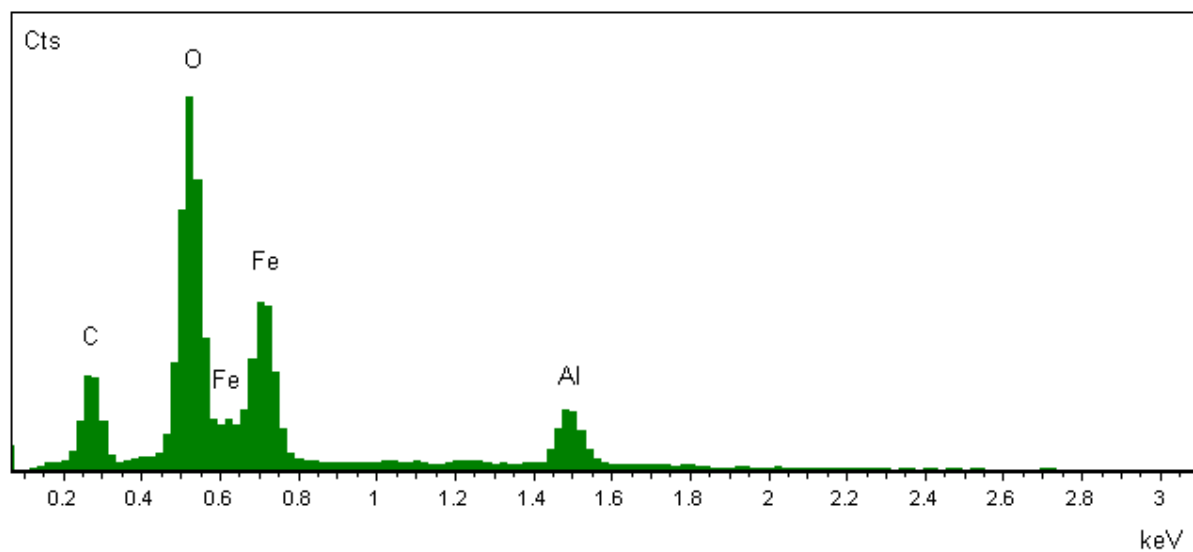


Fig. S10 EDS analysis of aluminium/magnetite substrate after laser irradiation experiment in carbon dioxide.

Particle size distribution

The particle size distribution of the spherical carbon particles on the aluminium/copper substrate shown in Fig. 1 is presented in Fig. S11. Note that the graph is based on the individual spherical particles without taking into account the formation of clusters. The mean diameter calculated from this data is 360 nm.

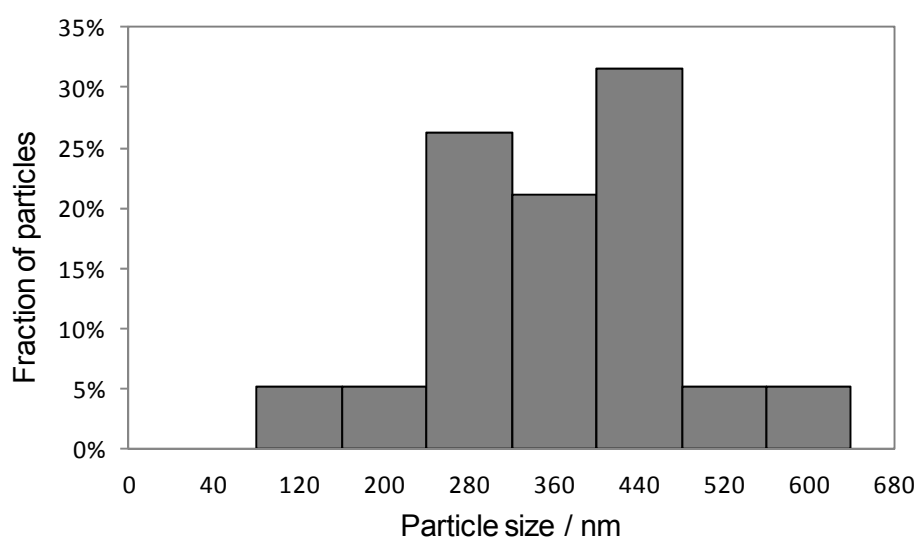


Fig. S11 Particle size distribution of spherical carbon particles obtained from carbon dioxide under laser irradiation (aluminium/copper substrate). The size distribution was determined manually from the SEM image by counting the particles and measuring their diameter.