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Bibliometric Analysis of the Fuel Journal Publications. 2015 — 2019

Bases of publications: The Lens and WoS

Objective: to study the priority topics of publications in the journal, the main institutions, funding organizations, countries and their co-occurrence.

Type of this document: DATA

Motivation: to personally understand the interests and priorities of the Fuel journal that is very significant for the petroleum industry. I hope the colleagues will also be interested to get acquainted with the obtained bibliometric data.

The Lens

Filters: Year published = (2015 — 2019) Source Title = (Fuel) Publication Type = (Journal Article). Scholarly Works (9,471) = All Docs

Filters: Year published = (2015 — 2019) Source Title = (Fuel) Publication Type = (Journal Article) Publisher = (Elsevier BV). Scholarly Works (8,093) = All Docs

The difference is due to the fact that the Lens system additionally indexes publications in Chinese and Korean that are classified as FUEL articles

Table 1. Top Institutions by published documents in journal "FUEL" in 2015 — 2019

Institution Name	Document Count	Institution Name	Document Count
China University of Mining and Technology	339	University of Texas at Austin	53
Chinese Academy of Sciences	324	Southwest Petroleum University	51
China University of Petroleum	299	Commonwealth Scientific and Industrial Research Organisation	50
Huazhong University of Science and Technology	176	Beijing University of Chemical Technology	47
Tsinghua University	165	Jiangsu University	47
Tianjin University	147	Southeast University	47
University of Calgary	139	Freiberg University of Mining and Technology	44
Zhejiang University	127	Missouri University of Science and Technology	44
Xi'an Jiaotong University	123	Sinopec	43
Shanghai Jiao Tong University	108	Applied Science Private University	40
East China University of Science and Technology	95	Federal University of Rio de Janeiro	40
China University of Geosciences	86	Monash University	40
University of Science and Technology of China	84	Shandong University of Science and Technology	40
Spanish National Research Council	73	University of Queensland	39
Taiyuan University of Technology	72	Lund University	37
Curtin University	70	Islamic Azad University	36
Pennsylvania State University	69	Beihang University	35

Institution Name	Document Count	Institution Name	Document Count
Beijing Institute of Technology	67	Amirkabir University of Technology	33
Dalian University of Technology	67	Centre national de la recherche scientifique	33
University of Alberta	67	Imperial College London	33
PetroChina	64	RWTH Aachen University	33
North China Electric Power University	57	University of Leeds	33
Chongqing University	56	KAIST	32
Harbin Institute of Technology	56	Mexican Institute of Petroleum	32
King Abdullah University of Science and Technology	54	Petrobras	32

Remarks: The articles of Chinese universities dominate in this journal; China's petroleum giants (PetroChina and Sinopec) are also well represented in FUEL. North American universities (University of Calgary, Pennsylvania State University, University of Texas at Austin, Missouri University of Science and Technology) publications are also well represented. Universities of the Middle East (Islamic Azad University, Amirkabir University of Technology) are actively publishing in FUEL

File — 'Fuel_Lens_2015-2019_data-Top Institutions by number of Scholarly Works.csv' on figshare.com or 'Fuel_Lens_2015-2019_Top Institutions by number of Scholarly Works.svg' as SVG figure.

Table 2. Top Fieldes of studies by number of published documents in journal "FUEL" in 2015 — 2019

Field of Study	Document Count	Field of Study	Document Count
Chemistry	9176	**Hydrogen**	343
Inorganic chemistry	6250	NOx	337
Organic chemistry	3067	Soot	315
Combustion	1614	Methanol	310
Environmental chemistry	1332	Viscosity	307
Coal	1214	Oil shale	305
Catalysis	1132	Flow (psychology)	286
Chemical engineering	1070	Oxygen	279
Diesel fuel	895	**Biofuel**	269
Analytical chemistry	713	**Syngas**	256
Pyrolysis	672	Raw material	250
Biodiesel	656	Waste management	250
Adsorption	618	Coke	239
Ignition system	579	Metallurgy	238
Methane	571	Porosity	235
Biomass	556	Thermogravimetric analysis	231
Mechanics	517	Process engineering	225
Thermodynamics	505	Hydrocarbon	224
Pulp and paper industry	502	Combustor	222
Carbon	485	Chromatography	215
Char	425	Fly ash	212
Diesel engine	397	Sulfur	212
Mineralogy	388	Flue gas	209
Gasoline	348	Asphaltene	207
Particle	348	Heat of combustion	207

Remarks: The issue of new fuels are well presented in publications (Biodiesel, Gasoline, Hydrogen, Biofuel). Much research has focused on coal as a widely available resource that needs to be converted to cleaner fuels.

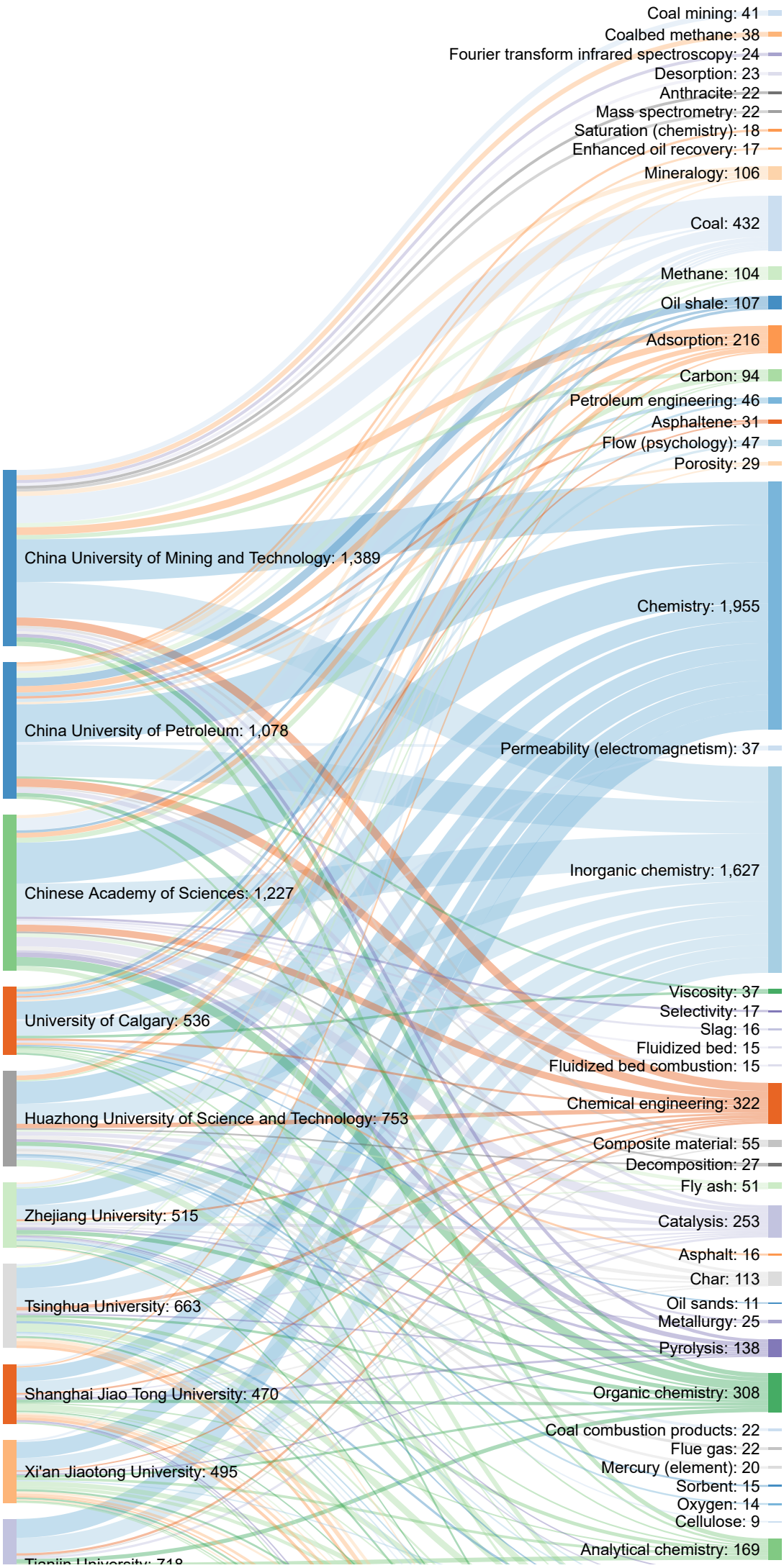
File — 'Fuel_Lens_2015-2019_Top Fields of Study by Document Count.svg' as SVG figure on figshare.com.

Table 3. Example of two results as Institution Name vs Field of Study by Document Count

Institution Name	Document Count	Field of Study	Institution Name	Document Count	Field of Study
China University of Mining and Technology	338	Chemistry	China University of Petroleum	298	Chemistry
China University of Mining and Technology	279	Inorganic chemistry	China University of Petroleum	250	Inorganic chemistry
China University of Mining and Technology	213	Coal	China University of Petroleum	65	Chemical engineering
China University of Mining and Technology	65	Chemical engineering	China University of Petroleum	65	Oil shale
China University of Mining and Technology	62	Adsorption	China University of Petroleum	50	Adsorption
China University of Mining and Technology	41	Coal mining	China University of Petroleum	39	Methane
China University of Mining and Technology	38	Coalbed methane	China University of Petroleum	35	Catalysis
China University of Mining and Technology	36	Mineralogy	China University of Petroleum	34	Mineralogy
China University of Mining and Technology	36	Organic chemistry	China University of Petroleum	30	Organic chemistry
China University of Mining and Technology	34	Analytical chemistry	China University of Petroleum	29	Petroleum engineering
China University of Mining and Technology	33	Carbon	China University of Petroleum	28	Flow (psychology)
China University of Mining and Technology	33	Methane	China University of Petroleum	21	Permeability (electromagnetism)
China University of Mining and Technology	26	Pyrolysis	China University of Petroleum	19	Asphaltene
China University of Mining and Technology	24	Fourier transform infrared spectroscopy	China University of Petroleum	18	Saturation (chemistry)
China University of Mining and Technology	23	Catalysis	China University of Petroleum	17	Analytical chemistry

Institution Name	Document Count	Field of Study	Institution Name	Document Count	Field of Study
China University of Mining and Technology	23	Desorption	China University of Petroleum	17	Enhanced oil recovery
China University of Mining and Technology	22	Anthracite	China University of Petroleum	17	Porosity
China University of Mining and Technology	22	Mass spectrometry	China University of Petroleum	17	Viscosity
China University of Mining and Technology	21	Composite material	China University of Petroleum	16	Coal
China University of Mining and Technology	20	Char	China University of Petroleum	13	Composite material

Remarks: more data are in file — 'Fuel_Lens_2015-2019_data-Institution Name by Field of Study by Document Count.csv' OR you can use file — 'Fuel_Lens_2015-2019_data-Institution Name by Field of Study by Document Count for Sankey.txt' to copy data to http://sankeymatic.com/build/ to build Sankey diagram.


Coal mining: 41
Coalbed methane: 38
Fourier transform infrared spectroscopy: 24
Desorption: 23
Anthracite: 22
Mass spectrometry: 22
Saturation (chemistry): 18
Enhanced oil recovery: 17
Mineralogy: 106
Coal: 432
Methane: 104
Oil shale: 107
Adsorption: 216
Carbon: 94
Petroleum engineering: 46
Asphaltene: 31
Flow (psychology): 47
Porosity: 29
China University of Mining and Technology: 1,389
Chemistry: 1,955
China University of Petroleum: 1,078
Permeability (electromagnetism): 37
Chinese Academy of Sciences: 1,227
Inorganic chemistry: 1,627
Viscosity: 37
Selectivity: 17
Slag: 16
Fluidized bed: 15
Fluidized bed combustion: 15
University of Calgary: 536
Chemical engineering: 322
Huazhong University of Science and Technology: 753
Composite material: 55
Decomposition: 27
Fly ash: 51
Zhejiang University: 515
Catalysis: 253
Asphalt: 16
Char: 113
Tsinghua University: 663
Oil sands: 11
Metallurgy: 25
Pyrolysis: 138
Shanghai Jiao Tong University: 470
Organic chemistry: 308
Coal combustion products: 22
Flue gas: 22
Xi'an Jiaotong University: 495
Mercury (element): 20
Sorbent: 15
Oxygen: 14
Cellulose: 9
Analytical chemistry: 169

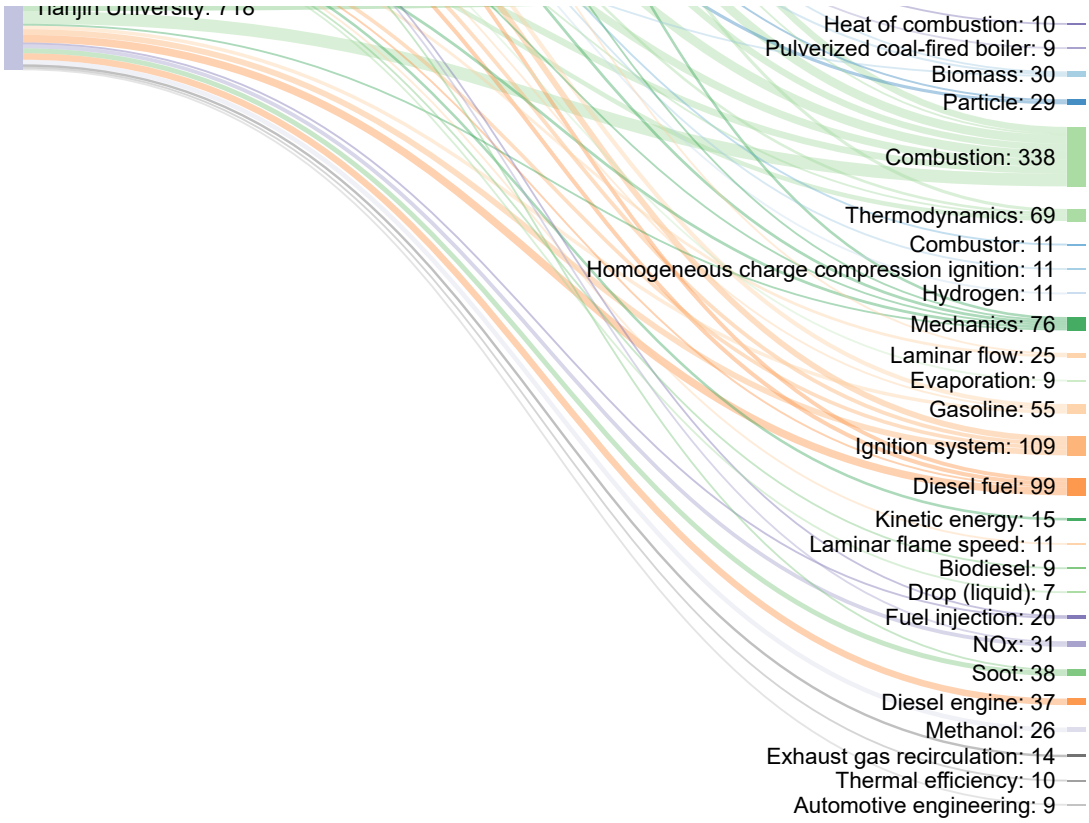


Figure 1. Institution Name by Field of Study by Document Count as Sankey Diagram

File — 'Fuel_Lens_2015-2019_data-Institution Name by Field of Study by Document Count for Sankey.svg'

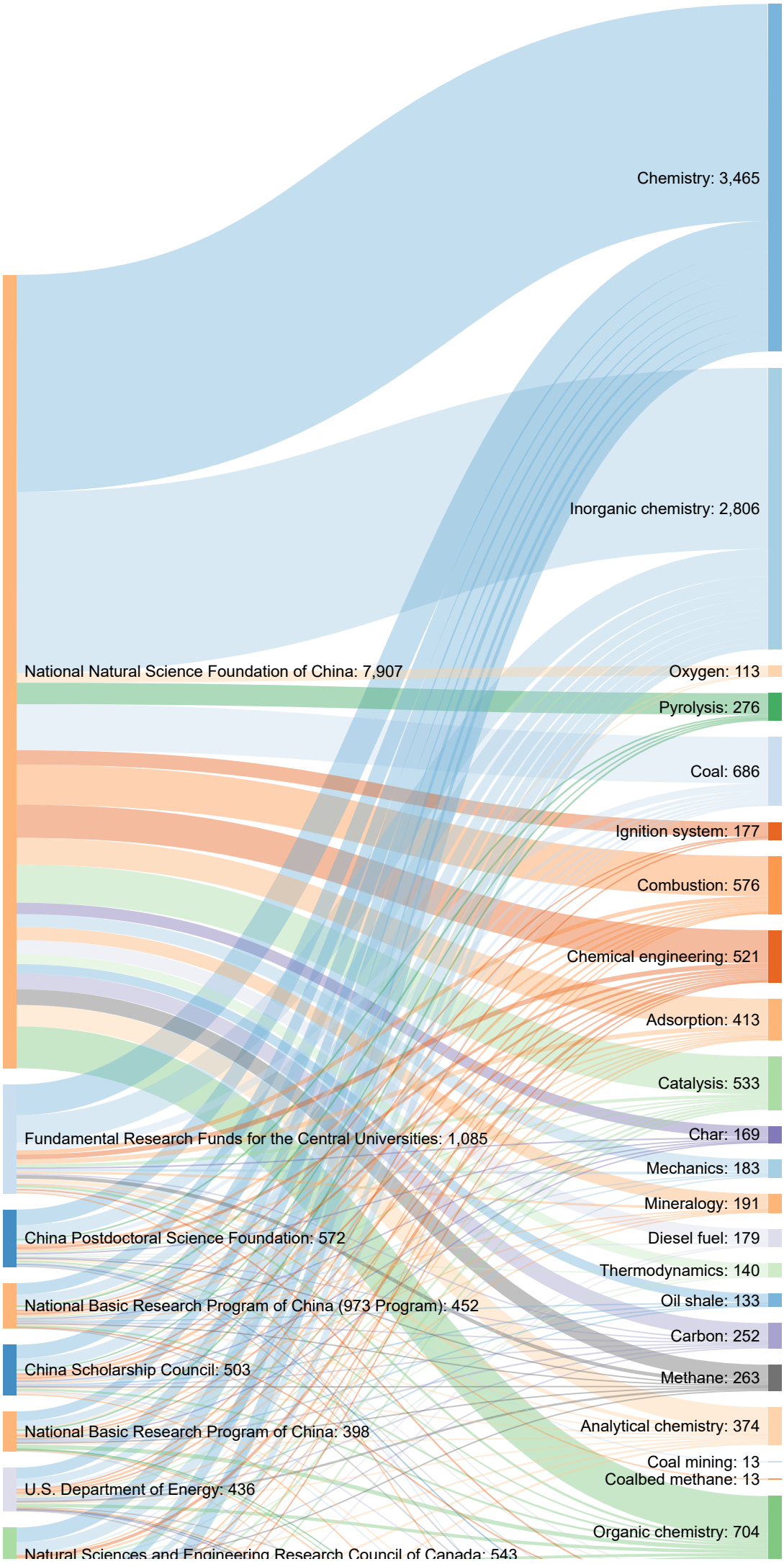
Table 4. Example of two results as Funding vs Field of Study by Document Count

Funding	Document Count	Field of Study	Funding	Document Count	Field of Study
China Postdoctoral Science Foundation	157	Chemistry	China Scholarship Council	137	Chemistry
China Postdoctoral Science Foundation	135	Inorganic chemistry	China Scholarship Council	111	Inorganic chemistry
China Postdoctoral Science Foundation	38	Coal	China Scholarship Council	29	Coal
China Postdoctoral Science Foundation	27	Chemical engineering	China Scholarship Council	28	Combustion
China Postdoctoral Science Foundation	25	Combustion	China Scholarship Council	20	Organic chemistry
China Postdoctoral Science Foundation	24	Adsorption	China Scholarship Council	19	Chemical engineering
China Postdoctoral Science Foundation	17	Analytical chemistry	China Scholarship Council	16	Oil shale
China Postdoctoral Science Foundation	16	Pyrolysis	China Scholarship Council	15	Adsorption
China Postdoctoral Science Foundation	15	Organic chemistry	China Scholarship Council	15	Mechanics

Funding	Document Count	Field of Study	Funding	Document Count	Field of Study
China Postdoctoral Science Foundation	13	Catalysis	China Scholarship Council	14	Flow (psychology)
China Postdoctoral Science Foundation	13	Thermodynamics	China Scholarship Council	12	Analytical chemistry
China Postdoctoral Science Foundation	12	Char	China Scholarship Council	12	Ignition system
China Postdoctoral Science Foundation	11	Carbon	China Scholarship Council	11	Biomass
China Postdoctoral Science Foundation	11	Composite material	China Scholarship Council	11	Composite material
China Postdoctoral Science Foundation	11	Diesel fuel	China Scholarship Council	10	Mineralogy
China Postdoctoral Science Foundation	11	Methane	China Scholarship Council	9	Carbon
China Postdoctoral Science Foundation	10	Particle size	China Scholarship Council	9	Porosity
China Postdoctoral Science Foundation	10	Permeability (electromagnetism)	China Scholarship Council	9	Pyrolysis
China Postdoctoral Science Foundation	8	Desorption	China Scholarship Council	8	Char
China Postdoctoral Science Foundation	8	Flue gas	China Scholarship Council	8	Methane

Remarks: more data are in file — 'Fuel_Lens_2015-2019_data-Funding by Field of Study by Document Count.csv' OR you can use file — 'Fuel_Lens_2015-2019_data-Funding by Field of Study by Document Count for Sankey.txt' to copy data to http://sankeymatic.com/build/ to build Sankey diagram. Data as figure file — 'Fuel_Lens_2015-2019_Funding by Field of Study by Document Count.svg'

Chemistry, Inorganic chemistry and **Coal** are most hot topics for FUEL journal publications


Chemistry: 3,465
Inorganic chemistry: 2,806
National Natural Science Foundation of China: 7,907
Oxygen: 113
Pyrolysis: 276
Coal: 686
Ignition system: 177
Combustion: 576
Chemical engineering: 521
Adsorption: 413
Catalysis: 533
Fundamental Research Funds for the Central Universities: 1,085
Char: 169
Mechanics: 183
Mineralogy: 191
China Postdoctoral Science Foundation: 572
Diesel fuel: 179
Thermodynamics: 140
National Basic Research Program of China (973 Program): 452
Oil shale: 133
Carbon: 252
China Scholarship Council: 503
Methane: 263
National Basic Research Program of China: 398
Analytical chemistry: 374
Coal mining: 13
Coalbed methane: 13
U.S. Department of Energy: 436
Organic chemistry: 704
Natural Sciences and Engineering Research Council of Canada: 543

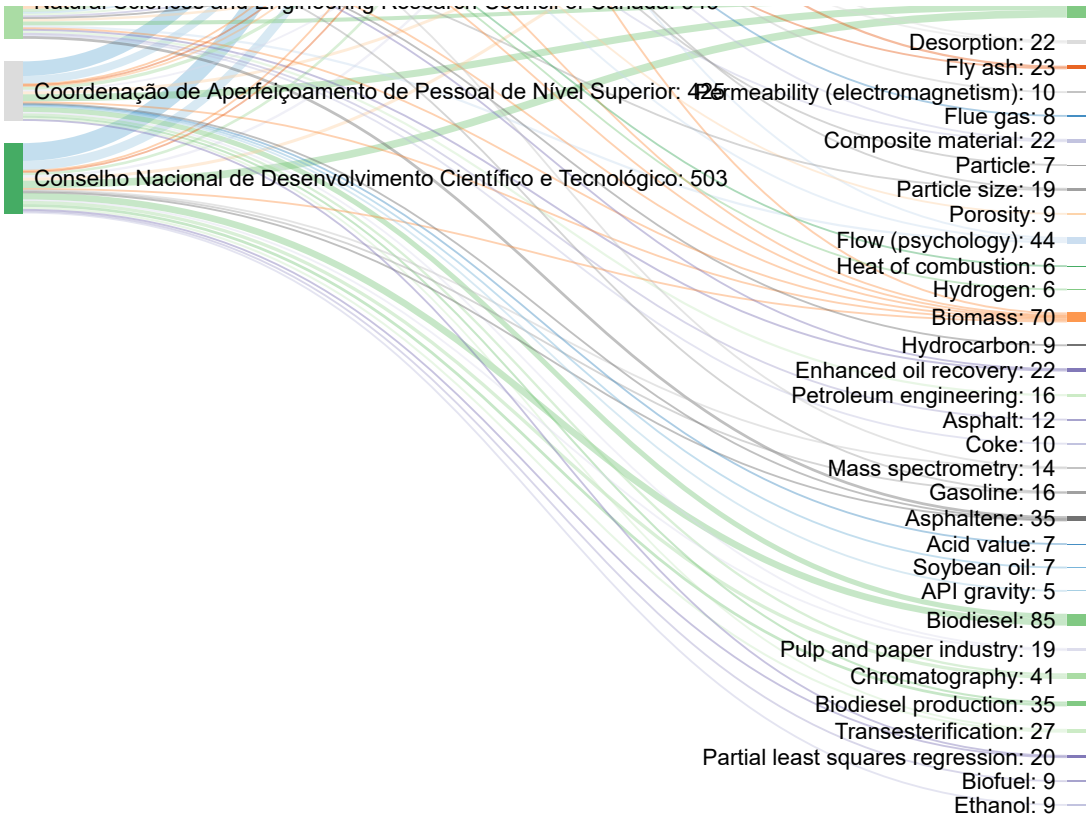


Figure 2. Funding by Field of Study by Document Count as Sankey Diagram

Fuel_Lens_2015-2019_data-Funding by Field of Study by Document Count for Sankey.svg

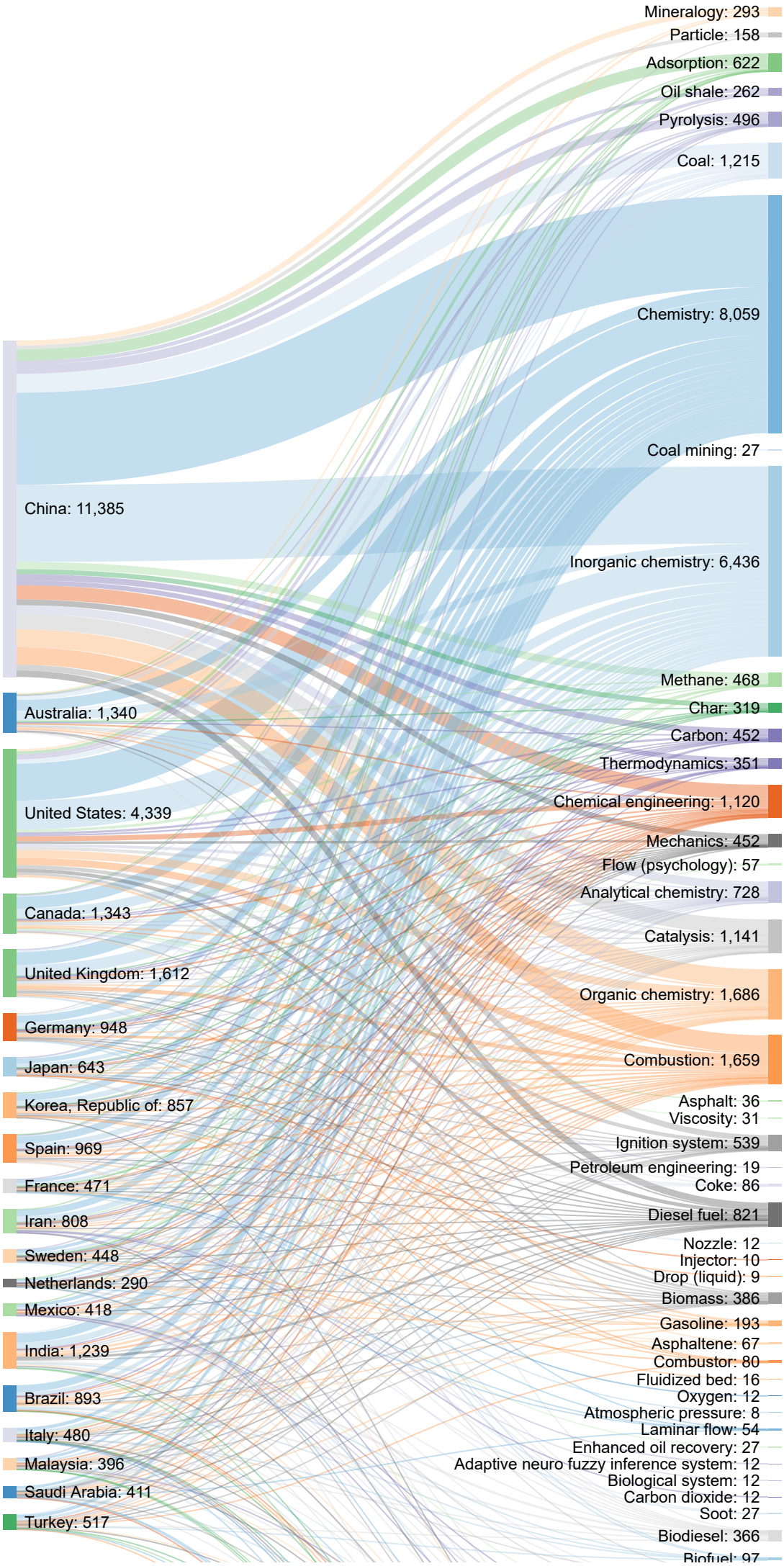
Table 5. Top two results as Institution Country vs Field of Study by Document Count

Institution Country/Region	Document Count	Field of Study	Institution Country/Region	Document Count	Field of Study
China	3115	Chemistry	United States	1252	Chemistry
China	2609	Inorganic chemistry	United States	979	Inorganic chemistry
China	639	**Coal**	United States	272	Organic chemistry
China	608	Organic chemistry	United States	238	Combustion
China	591	Combustion	United States	173	Chemical engineering
China	522	**Catalysis**	United States	146	**Coal**
China	482	Chemical engineering	United States	126	**Ignition system**
China	390	Adsorption	United States	123	**Diesel fuel**
China	310	**Pyrolysis**	United States	110	**Oil shale**
China	291	Analytical chemistry	United States	105	**Catalysis**
China	246	Methane	United States	100	Analytical chemistry
China	221	**Diesel fuel**	United States	96	Adsorption
China	210	Carbon	United States	91	Methane
China	196	Mechanics	United States	85	Biomass
China	194	**Ignition system**	United States	84	Mechanics
China	178	Mineralogy	United States	81	Gasoline
China	166	Char	United States	76	Carbon
China	165	Thermodynamics	United States	76	Mineralogy

Institution Country/Region	Document Count	Field of Study	Institution Country/Region	Document Count	Field of Study
China	129	**Oil shale**	United States	67	**Pyrolysis**
China	123	Particle	United States	59	Thermodynamics

Remarks: more data are in file — 'Fuel_Lens_2015-2019_data-Institution Country by Field of Study by Document Count.csv' OR you can use file — 'Fuel_Lens_2015-2019_data-Institution Country by Field of Study by Document Count for Sankey.txt' to copy data to http://sankeymatic.com/build/ to build Sankey diagram.

Coal, Pyrolysis and Catalysis more relevant for China publications than for the USA, Oil shale, Diesel fuel and Ignition system — more relevant for the USA


China: 11,385
Australia: 1,340
United States: 4,339
Canada: 1,343
United Kingdom: 1,612
Germany: 948
Japan: 643
Korea, Republic of: 857
Spain: 969
France: 471
Iran: 808
Sweden: 448
Netherlands: 290
Mexico: 418
India: 1,239
Brazil: 893
Italy: 480
Malaysia: 396
Saudi Arabia: 411
Turkey: 517
Mineralogy: 293
Particle: 158
Adsorption: 622
Oil shale: 262
Pyrolysis: 496
Coal: 1,215
Chemistry: 8,059
Coal mining: 27
Inorganic chemistry: 6,436
Methane: 468
Char: 319
Carbon: 452
Thermodynamics: 351
Chemical engineering: 1,120
Mechanics: 452
Flow (psychology): 57
Analytical chemistry: 728
Catalysis: 1,141
Organic chemistry: 1,686
Combustion: 1,659
Asphalt: 36
Viscosity: 31
Ignition system: 539
Petroleum engineering: 19
Coke: 86
Diesel fuel: 821
Nozzle: 12
Injector: 10
Drop (liquid): 9
Biomass: 386
Gasoline: 193
Asphaltene: 67
Combustor: 80
Fluidized bed: 16
Oxygen: 12
Atmospheric pressure: 8
Laminar flow: 54
Enhanced oil recovery: 27
Adaptive neuro fuzzy inference system: 12
Biological system: 12
Carbon dioxide: 12
Soot: 27
Biodiesel: 366
Biofuel: 97

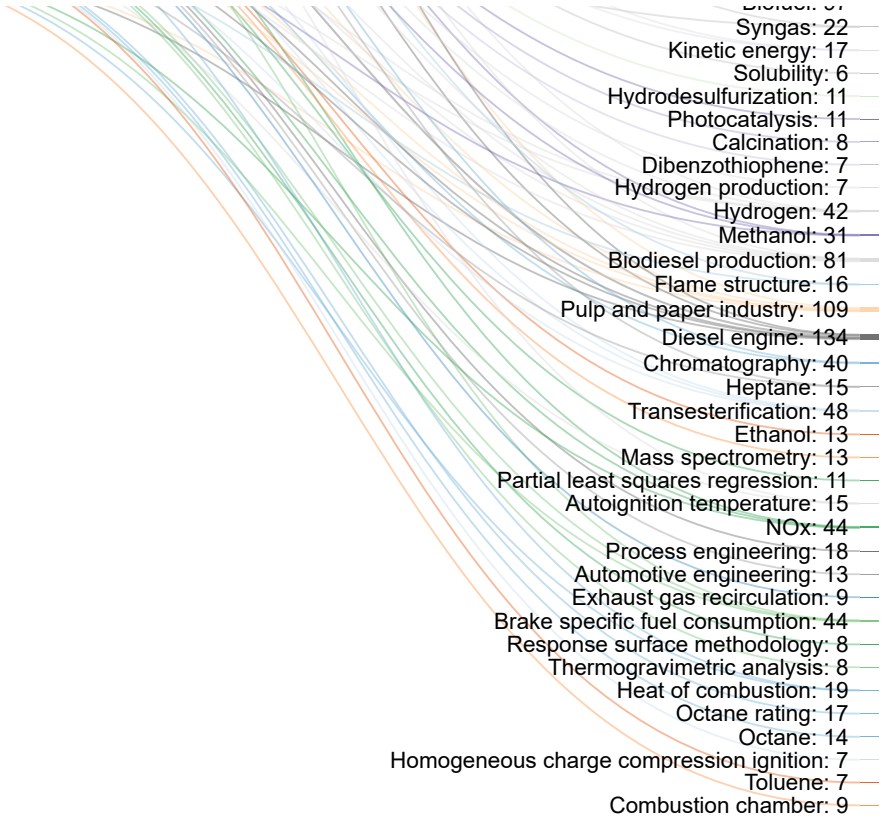


Figure 3. Institution Country by Field of Study by Document Count as Sankey Diagram

'Fuel_Lens_2015-2019_data-Institution Country by Field of Study by Document Count for Sankey.svg'

VOSviewer

Common remark: Fuel fields-of-study from The Lens was used as index-keywords in Scopus

Table 6. Top keywords occurrences and total link strength get by VOSviewer use

keyword	occurrences	total link strength	keyword	occurrences	total link strength	keyword	occurrences	total link strength
chemistry	7798	63765	*diesel engine*	397	3634	process engineering	229	1805
inorganic chemistry	6160	51659	mineralogy	388	3290	hydrocarbon	224	1912
organic chemistry	1752	13872	particle	348	3059	combustor	221	1949
combustion	1613	14410	*gasoline*	347	3099	sulfur	221	1860
coal	1213	10257	hydrogen	343	2957	environmental chemistry	220	1804
catalysis	1132	9524	nox	337	3086	chromatography	214	1761
chemical engineering	1065	9474	soot	316	2882	fly ash	212	1793
diesel fuel	895	8023	methanol	309	2631	heat of combustion	211	1873
analytical chemistry	713	6199	viscosity	307	2583	flue gas	210	1769
pyrolysis	672	5837	oil shale	305	2465	asphaltene	209	1718
biodiesel	656	5480	flow (psychology)	286	2386	particle size	208	1841
adsorption	618	5340	oxygen	279	2388	petroleum engineering	203	1549
ignition system	578	5212	*biofuel*	270	2307	*biodiesel production*	202	1717
methane	571	4912	syngas	255	2262	fourier transform infrared spectroscopy	200	1705
biomass	556	4745	raw material	253	2189	transesterification	198	1688
mechanics	517	4369	waste management	252	2136	composite material	193	1656
thermodynamics	505	4139	coke	239	2043	tar	188	1669

keyword	occurrences	total link strength	keyword	occurrences	total link strength	keyword	occurrences	total link strength
pulp and paper industry	502	4385	metallurgy	237	1969	thermal efficiency	186	1728
carbon	485	4240	porosity	237	2020	selectivity	177	1451
char	425	3824	thermogravimetric analysis	233	2046	laminar flow	176	1529

Remarks: Coal, Pyrolysis and Catalysis are in top — similarity with table 5 data

Table 7. Top keywords in clusters in co-occurrence net built by VOSviewer (cutting down: C as cluster; Occur as occurrences)

label	C	Occur	label	C	Occur	label	C	Occur	label	C	Occur
chemistry	1	7798	catalysis	2	1132	**pyrolysis**	3	672	**coal**	4	1213
inorganic chemistry	1	6160	chemical engineering	2	1065	thermogravimetric analysis	3	233	**char**	4	425
methane	1	571	adsorption	2	618	hydrocarbon	3	224	**waste management**	4	252
mineralogy	1	388	carbon	2	485	chromatography	3	214	**coke**	4	239
viscosity	1	307	**hydrogen**	2	343	**asphaltene**	3	209	**metallurgy**	4	237
oil shale	1	305	oxygen	2	279	fourier transform infrared spectroscopy	3	200	process engineering	4	229
flow (psychology)	1	286	syngas	2	255	**decomposition**	3	163	environmental chemistry	4	220
porosity	1	237	**sulfur**	2	221	nitrogen	3	163	fly ash	4	212
petroleum engineering	1	203	selectivity	2	177	solvent	3	153	heat of combustion	4	211
composite material	1	193	flue-gas desulfurization	2	163	reaction rate	3	147	flue gas	4	210
permeability (electromagnetism)	1	162	desorption	2	158	kinetics	3	143	particle size	4	208
natural gas	1	158	x-ray photoelectron spectroscopy	2	134	mass spectrometry	3	138	tar	4	188
enhanced oil recovery	1	142	calcination	2	121	**toluene**	3	137	fluidized bed	4	173
porous medium	1	135	specific surface area	2	116	activation energy	3	129	coal combustion products	4	151
saturation (chemistry)	1	135	nuclear chemistry	2	113	supercritical fluid	3	119	fossil fuel	4	129
carbon dioxide	1	123	zeolite	2	111	cracking	3	112	mercury (element)	4	118
coal mining	1	122	mesoporous material	2	109	distillation	3	107	wood gas generator	4	110
coalbed methane	1	107	metal	2	104	**ionic liquid**	3	92	sorbent	4	108
volumetric flow rate	1	105	oxide	2	102	reaction mechanism	3	92	bituminous coal	4	105
surface tension	1	102	scanning electron microscope	2	100	gas chromatography	3	88	slag	4	92
water content	1	99	steam reforming	2	98	molecule	3	88	carbonization	4	85
moisture	1	95	activated carbon	2	91	solubility	3	88	pulverized coal-fired boiler	4	81
hydrate	1	94	nanoparticle	2	91	radical	3	86	boiler (power generation)	4	78
sorption	1	92	**hydrogen production**	2	90	**benzene**	3	83	pellets	4	72
pulmonary surfactant	1	91	chemical looping combustion	2	83	fuel oil	3	77	solid fuel	4	70
asphalt	1	87	**hydrodesulfurization**	2	81	chemical kinetics	3	76	fluidized bed combustion	4	67
wetting	1	87	isothermal process	2	80	**fluid catalytic cracking**	3	73	chemical composition	4	66
mass transfer	1	84	redox	2	77	alkyl	3	69	leaching (agriculture)	4	61

label	C	Occur	label	C	Occur	label	C	Occur	label	C	Occur
organic matter	1	84	dibenzothiophene	2	73	**heptane**	3	68	alkali metal	4	59
anthracite	1	81	nickel	2	72	liquefaction	3	65	atmosphere	4	59

data from file — Fuel_Lens_2015-2019_as4ScopusKW co-occurrence map.tsv; You can build co-occurrence net by VOSviewer using this file (change the extension to .txt) and 'Fuel_Lens_2015-2019_as4ScopusKW co-occurrence net.txt'

Interesting subtheme in cluster 2: hydrogen - sulfur - hydrogen production - hydrodesulfurization

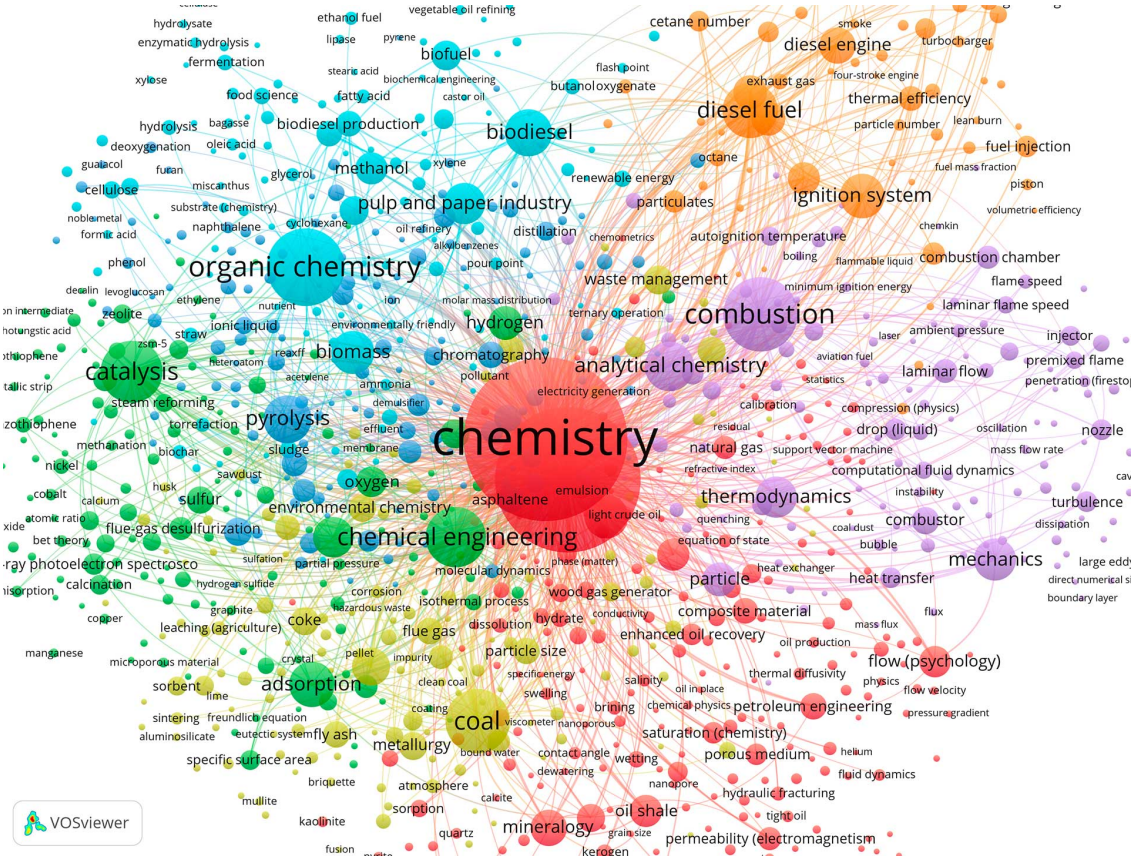


Figure 4. keywords co-occurrence clusters built by VOSviewer https://ndownloader.figshare.com/files/21358458

WoS

Query: (from Web of Science Core Collection) You searched for: PUBLICATION NAME: (fuel) Refined by: DOCUMENT TYPES: (ARTICLE) Timespan: 2015-2020. Indexes: SCI-EXPANDED, ESCI. Results: 7,889

Publications by Years; 2020 (374); 2019 (2,098); 2018 (1,638); 2017 (1,312); 2016 (1,285)

ARTICLE (7,889); PROCEEDINGS PAPER (262); REVIEW (146); CORRECTION (43); LETTER (23)

By using query: (from Web of Science Core Collection) You searched for: PUBLICATION NAME: (fuel) AND TOPIC: (petroleum OR hydrocarbon OR "heavy oil" OR "shale* oil" OR "natural gas" OR "shale gas") Refined by: DOCUMENT TYPES: (ARTICLE) Timespan: 2015-2020. Indexes: SCI-EXPANDED, ESCI. get Results: 2,101 relation to petroleum industry 2,101/7,889*100%=26,6%; more than a quarter of publications are related to petroleum science

Table 8. Top most cited publications in FUEL.

Title	Authors	Total Citations
Pore structure characterization of different rank **coals** using gas adsorption and scanning electron microscopy	Nie Baisheng; Liu Xianfeng; Yang Longlong; Meng Junqing; Li Xiangchun	175

Title	Authors	Total Citations
An intelligent gel designed to control the spontaneous combustion of **coal**: Fire prevention and extinguishing properties	Cheng, Weimin; Hu, Xiangming; Xie, Jun; Zhao, Yanyun	170
Projection of world fossil fuels by country	Mohr, S. H.; Wang, J.; Ellem, G.; Ward, J.; Giurco, D.	144
Fine particulate formation and ash deposition during pulverized **coal** combustion of high-sodium lignite in a down-fired furnace	Li, Gengda; Li, Shuiqing; Huang, Qian; Yao, Qiang	134
Impact of properties of vegetable oil, **bio-diesel**, ethanol and n-butanol on the combustion and emissions of turbocharged HDDI diesel engine operating under steady and transient conditions	Rakopoulos, Dimitrios C.; Rakopoulos, Constantine D.; Giakoumis, Evangelos G.	132
Comparing the porosity and surface areas of **coal** as measured by gas adsorption, mercury intrusion and SAXS techniques	Okolo, Gregory N.; Everson, Raymond C.; Neomagus, Hein W. J. P.; Roberts, Mokone J.; Sakurovs, Richard	131
Combustion and emission characteristics of diesel engine fueled with diesel/**biodiesel**/pentanol fuel blends	Li Li; Wang Jianxin; Wang Zhi; Xiao Jianhua	124
CO2 injection for enhanced oil recovery in Bakken *tight oil* reservoirs	Yu, Wei; Lashgari, Hamid Reza; Wu, Kan; Sepehrnoori, Kamy	114
Enhancement of surfactant flooding performance by the use of silica nanoparticles	Zargartalebi, Mohammad; Kharrat, Riyaz; Barati, Nasim	107
Effect of exhaust gas recirculation (EGR) on performance and emissions of a constant speed DI **diesel** engine fueled with pentanol/diesel blends	Kumar, B. Rajesh; Saravanan, S.	106
Surface characterization of rice husk **bio-char** produced by liquefaction and application for cationic dye (Malachite green) adsorption	Leng, Lijian; Yuan, Xingzhong; Zeng, Guangming; Shao, Jianguang; Chen, Xiaohong; Wu, Zhibin; Wang, Hou; Peng, Xin	103
Molecular dynamics simulations of oil transport through inorganic nanopores in *shale*	Wang, Sen; Javadpour, Farzam; Feng, Qihong	102
Comparative analyses of diesel-waste oil **biodiesel** and propanol, n-butanol or 1-pentanol blends in a diesel engine	Atmanli, Alpaslan	99
A novel soluble nano-catalysts in diesel-**biodiesel** fuel blends to improve **diesel** engines performance and reduce exhaust emissions	Mirzajanzadeh, Mehrdad; Tabatabaei, Meisam; Ardjmand, Mehdi; Rashidi, Alimorad; Ghobadian, Barat; Barkhi, Mohammad; Pazouki, Mohammad	99
Dependence of gas *shale* fracture permeability on effective stress and reservoir pressure: Model match and insights	Chen, Dong; Pan, Zhejun; Ye, Zhihui	98
Experimental study on fracture initiation and propagation in *shale* using supercritical carbon dioxide fracturing	Zhang, Xinwei; Lu, Yiyu; Tang, Jiren; Zhou, Zhe; Liao, Yin	96
Torrefaction of **biomass** stalk and its effect on the yield and quality of pyrolysis products	Chen, Dengyu; Zheng, Zhongcheng; Fu, Kexin; Zeng, Ze; Wang, Jiajia; Lu, Mengting	96
Macromolecular and pore structures of Chinese tectonically deformed **coal** studied by atomic force microscopy	Pan, Jienan; Zhu, Haitao; Hou, Quanlin; Wang, Haichao; Wang, Sen	95
A study of the explosion parameters of vapor-liquid two-phase JP-10/air mixtures	Liu, Xueling; Wang, Yue; Zhang, Qi	94

Title	Authors	Total Citations
Production of char from sewage sludge employing hydrothermal carbonization: **Char properties**, combustion behavior and thermal characteristics	Peng, Chuan; Zhai, Yunbo; Zhu, Yun; Xu, Bibo; Wang, Tengfei; Li, Caiting; Zeng, Guangming	91
FTIR and Raman spectroscopy characterization of functional groups in various rank **coals**	He Xueqiu; Liu Xianfeng; Nie Baisheng; Song Dazhao	90
Experimental studies of spontaneous combustion and anaerobic cooling of **coal**	Deng, Jun; Xiao, Yang; Li, Qingwei; Lu, Junhui; Wen, Hu	90
Effect of different percentages of **biodiesel-diesel** blends on injection, spray, combustion, performance, and emission characteristics of a diesel engine	Lahane, Subhash; Subramanian, K. A.	88
Hydroprocessing of **bio-crude** from continuous hydrothermal liquefaction of microalgae	Biller, Patrick; Sharma, Brajendra K.; Kunwar, Bidhya; Ross, Andrew B.	87
Fast **pyrolysis of biomass** and waste plastic in a fluidized bed reactor	Xue, Yuan; Zhou, Shuai; Brown, Robert C.; Kelkar, Atul; Bai, Xianglan	87
Petrophysical and geomechanical characteristics of Canadian *tight oil* and liquid-rich gas reservoirs: I. Pore network and permeability characterization	Ghanizadeh, A.; Clarkson, C. R.; Aquino, S.; Ardakani, O. H.; Sanei, H.	87
Insight into the structural features of Zhaotong lignite using multiple techniques	Li, Zhan-Ku; Wei, Xian-Yong; Yan, Hong-Lei; Zong, Zhi-Min	87
Chemical-structural properties of South African bituminous **coals:** Insights from wide angle XRD-carbon fraction analysis, ATR-FTIR, solid state C-13 NMR, and HRTEM techniques	Okolo, Gregory N.; Neomagus, Hein W. J. P.; Everson, Raymond C.; Roberts, Mokone J.; Bunt, John R.; Sakurovs, Richard; Mathews, Jonathan P.	85
Combustion and emission characteristics of a turbocharged diesel engine using high premixed ratio of methanol and **diesel fuel**	Wei, Lijiang; Yao, Chunde; Wang, Quangang; Pan, Wang; Han, Guopeng	85

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In highly cited works, much attention is paid to **the topic of coal and biodiesel**.

Table 9. Top organizations by number of published documents

Organizations-Enhanced	records	Organizations-Enhanced	records
CHINESE ACADEMY OF SCIENCES	430	UNITED STATES DEPARTMENT OF ENERGY DOE	115
CHINA UNIVERSITY OF MINING TECHNOLOGY	365	INSTITUTE OF COAL CHEMISTRY CAS	109
CHINA UNIVERSITY OF PETROLEUM	311	EAST **CHINA** UNIVERSITY OF SCIENCE TECHNOLOGY	96
HUAZHONG UNIVERSITY OF SCIENCE TECHNOLOGY	186	TAIYUAN UNIVERSITY OF TECHNOLOGY	95
UNIVERSITY OF **CHINESE** ACADEMY OF SCIENCES CAS	182	UNIVERSITY OF SCIENCE TECHNOLOGY OF **CHINA**	94
TSINGHUA UNIVERSITY	174	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	90
TIANJIN UNIVERSITY	155	**CHINA** UNIVERSITY OF GEOSCIENCES	90
INDIAN INSTITUTE OF TECHNOLOGY SYSTEM IIT SYSTEM	146	**CHINA** NATIONAL PETROLEUM CORPORATION	79
UNIVERSITY OF CALGARY	141	CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS CSIC	79

Organizations-Enhanced	records	Organizations-Enhanced	records
ZHEJIANG UNIVERSITY	140	CURTIN UNIVERSITY	79
XI AN JIAOTONG UNIVERSITY	138	PENNSYLVANIA COMMONWEALTH SYSTEM OF HIGHER EDUCATION PCSHE	78
SHANGHAI JIAO TONG UNIVERSITY	119	UNIVERSITY OF ALBERTA	76
		DALIAN UNIVERSITY OF TECHNOLOGY	74

The dominance of Chinese universities can explain the importance of coal issue. The topic of coal is also important for North American and Australian universities

file on figshare: 'Fuel_WoS_2015-2019_analyze-Organizations-Enhanced.tsv'

Table 10. Top funding agencies by number of published documents

Funding Agencies	records	Funding Agencies	records
NATIONAL NATURAL SCIENCE FOUNDATION OF **CHINA**	2395	NATURAL SCIENCE FOUNDATION OF **JIANGSU PROVINCE**	79
FUNDAMENTAL RESEARCH FUNDS FOR THE **CENTRAL UNIVERSITIES**	483	NATURAL SCIENCE FOUNDATION OF **SHANDONG PROVINCE**	79
NATIONAL BASIC RESEARCH PROGRAM OF **CHINA**	282	CONSEJO NACIONAL DE CIENCIA Y TECNOLOGIA CONACYT	74
CHINA SCHOLARSHIP COUNCIL	198	PRIORITY ACADEMIC PROGRAM DEVELOPMENT OF **JIANGSU** HIGHER EDUCATION INSTITUTIONS	72
CHINA POSTDOCTORAL SCIENCE FOUNDATION	197	*GERMAN* RESEARCH FOUNDATION DFG	60
NATIONAL COUNCIL FOR SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT CNPQ	195	NATIONAL HIGH TECHNOLOGY RESEARCH AND DEVELOPMENT PROGRAM OF **CHINA**	53
NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA	184	PROGRAM FOR CHANGJIANG SCHOLARS INNOVATIVE RESEARCH TEAM IN UNIVERSITY **PCSIRT**	53
CAPES	165	**JIANGSU** PLANNED PROJECTS FOR POSTDOCTORAL RESEARCH FUNDS	42
NATIONAL KEY RESEARCH AND DEVELOPMENT PROGRAM OF **CHINA**	156	PRIORITY ACADEMIC PROGRAM DEVELOPMENT OF **JIANGSU** HIGHER EDUCATION INSTITUTIONS PAPD	39
UNITED STATES DEPARTMENT OF ENERGY DOE	148	FUNDACAO DE AMPARO A PESQUISA DO ESTADO DE SAO PAULO FAPESP	38
NATIONAL KEY R D PROGRAM OF **CHINA**	141	NATIONAL SCIENCE AND TECHNOLOGY MAJOR PROJECT	37
EUROPEAN UNION EU	130	*SWEDISH* ENERGY AGENCY	35
ENGINEERING PHYSICAL SCIENCES RESEARCH COUNCIL EPSRC	125	MINISTRY OF EDUCATION **CHINA** 111 PROJECT	34
AUSTRALIAN RESEARCH COUNCIL	95	NATURAL SCIENCE FOUNDATION OF **ZHEJIANG** PROVINCE	34
NATIONAL SCIENCE FOUNDATION NSF	85	PETROBRAS	34
CHINESE ACADEMY OF SCIENCES	80	CARLOS CHAGAS FILHO FOUNDATION FOR RESEARCH SUPPORT OF THE STATE OF RIO DE JANEIRO FAPERJ	32

The Chinese funding agencies are dominating, but North American, Australian, EU and even Brazilian funding agencies also support research articles published in FUEL

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Table 11. Top countries by number of published documents

Countries/Regions	records	Countries/Regions	records
PEOPLES R CHINA	3434	JAPAN	192
USA	1238	FRANCE	181
CANADA	483	ITALY	178
AUSTRALIA	414	**TURKEY**	139
ENGLAND	393	**MEXICO**	117
INDIA	379	SWEDEN	114
BRAZIL	311	POLAND	111
GERMANY	299	**MALAYSIA**	105
SPAIN	291	**SAUDI ARABIA**	103
SOUTH KOREA	268	**RUSSIA**	88
IRAN	235	FINLAND	64

PEOPLES R CHINA, USA, CANADA, AUSTRALIA, ENGLAND — major countries, which are published in the FUEL journal. TURKEY, MEXICO, INDIA, BRAZIL, POLAND, MALAYSIA, SAUDI ARABIA, IRAN — have more articles in FUEL then RUSSIA.

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Table 12. Top keywords by years by occurrence (occ)

keyword 2015	occ	keyword 2016	occ	keyword 2017	occ	keyword 2018	occ	keyword 2019	occ
combustion	152	combustion	158	combustion	182	combustion	138	performance	140
pyrolysis	105	performance	118	**pyrolysis**	104	performance	126	combustion	130
biodiesel	102	**biodiesel**	110	**biomass**	100	**pyrolysis**	91	**biomass**	85
biomass	102	**biomass**	94	performance	93	**biomass**	78	temperature	84
performance	93	**pyrolysis**	94	**biodiesel**	90	**biodiesel**	77	**pyrolysis**	81
kinetics	82	temperature	85	**coal**	81	model	77	**biodiesel**	80
temperature	79	adsorption	75	temperature	81	adsorption	65	behavior	74
gasification	72	kinetics	67	kinetics	65	**coal**	61	model	68
coal	61	**coal**	63	behavior	61	temperature	58	adsorption	67
emissions	58	**gasification**	55	**gasification**	60	kinetics	56	oxidation	55
model	55	ethanol	52	model	59	oxidation	55	**coal**	54
adsorption	54	behavior	51	adsorption	58	emissions	50	emissions	52
oxidation	50	model	50	emissions	58	behavior	49	fuel	52
fuel	46	emissions	49	methane	54	**gasification**	48	kinetics	45
conversion	45	water	49	oxidation	50	methane	46	methane	43
blends	44	conversion	48	ethanol	47	water	46	combustion characteristics	41
oil	41	fuel	48	fuel	46	mechanism	45	water	41
transesterification	41	methane	45	gasoline	43	oil	43	conversion	40
methane	39	oil	45	conversion	41	conversion	41	blends	39
optimization	39	permeability	45	oil	40	ethanol	39	co2	39
pressure	39	oxidation	44	carbon-dioxide	39	optimization	39	ethanol	39
ethanol	38	blends	43	gas	39	pressure	39	flow	39
removal	36	diesel engine	42	flow	38	simulation	39	**gasification**	39
behavior	35	transesterification	42	pressure	36	fuel	37	mechanism	38
lignite	35	carbon-dioxide	39	water	36	pore structure	37	oil	38
water	34	hydrogen	39	blends	35	permeability	35	carbon-dioxide	37
mixtures	33	pore structure	39	removal	33	carbon-dioxide	33	pressure	37

keyword 2015	occ	keyword 2016	occ	keyword 2017	occ	keyword 2018	occ	keyword 2019	occ
gasoline	32	exhaust emissions	37	**hydrogen**	31	**hydrogen**	33	ignition	34
diesel	31	methanol	37	lignite	31	flow	32	emission characteristics	33
reduction	30	bio-oil	35	catalyst	29	recovery	31	diesel	32

Mainly the subject of publications does not change significantly for 2015 - 2019

Table 13. Most common keywords containing the substring hydrogen (query: select * from table where keyword like '%hydrogen%')

keyword	occur	keyword	occur	keyword	occur	keyword	occur	keyword	occur
hydrogen	29	hydrogen	39	hydrogen	31	hydrogen	33	hydrogen	32
hydrogen-production	13	hydrogen-production	15	hydrogen-production	17	hydrogen-production	24	hydrogen-production	20
hydrogenation	13	hydrogenation	13	hydrogenation	17	hydrogenation	10	hydrogenation	12
hydrogen production	7	**hydrogen-peroxide**	7	**hydrogen-peroxide**	8	hydrogen addition	5	***biohydrogen***	6
hydrogen-sulfide	5	hydrogen production	5	hydrogen production	6	**hydrogen-sulfide**	5	**hydrogen-sulfide**	5
biohydrogen	4	hydrogen addition	3	co hydrogenation	3	hydrogen production	4	**hydrogen peroxide**	4
hydrogen addition	3	selective hydrogenation	3			**hydrogen-peroxide**	4	***hydrogenolysis***	4
hydrogen-peroxide	3					***hydrogenolysis***	3	***fermentative hydrogen-production***	3
								hydrogen addition	3
								hydrogen production	3
								hydrogen-peroxide	3

Hydrogenolysis is a chemical reaction whereby a carbon–carbon or carbon–heteroatom single bond is cleaved or undergoes lysis (breakdown) by hydrogen... In petroleum refineries, catalytic hydrogenolysis of feedstocks is conducted on a large scale to remove sulfur from feedstocks, releasing gaseous **hydrogen sulfide** (H2S). — https://en.wikipedia.org/wiki/Hydrogenolysis

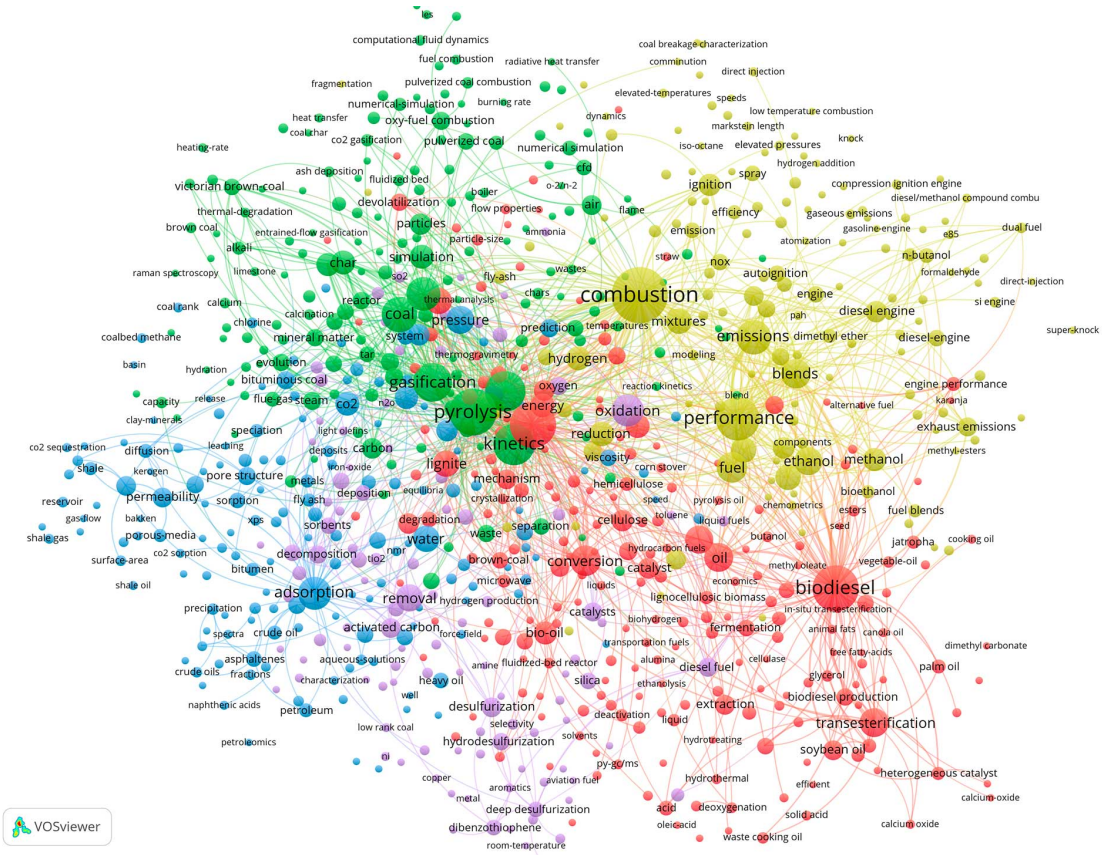

Figure 5. keywords co-occurrence clusters built by VOSviewer for top 1000 KW for 2015

file on figshare: "Fuel_WoS_2015-top-1000_KW-co-occurrence.png"

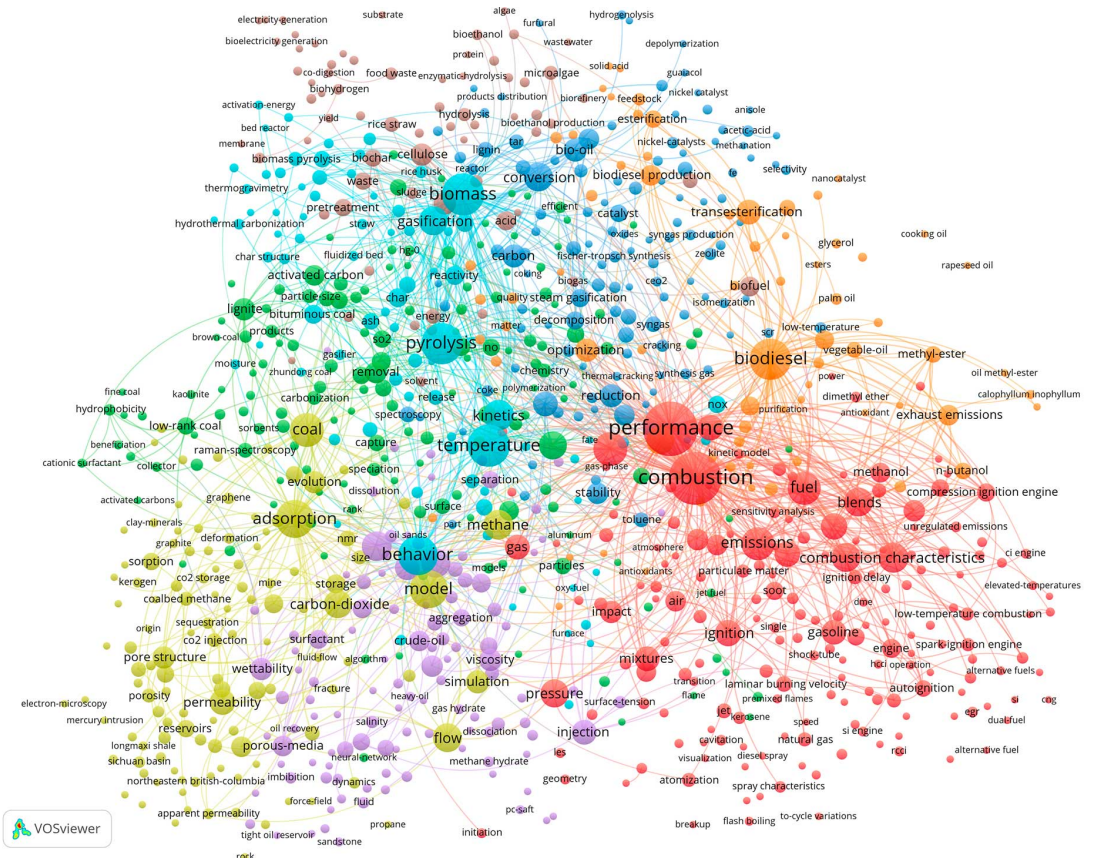

Figure 6. keywords co-occurrence clusters built by VOSviewer for top 1000 KW for 2019

file on figshare: "Fuel_WoS_2019-top-1000_KW-co-occurrence.png"

More the high resolution figures for 2015. 2016, 2017, 2018, 2019 are available on figshare.com:

- Fuel_WoS_2015-top-1000_KW-co-occurrence.png
- Fuel_WoS_2016-top-1000_KW-co-occurrence.png
- Fuel_WoS_2017-top-1000_KW-co-occurrence.png

- Fuel_WoS_2018-top-1000_KW-co-occurrence.png
- Fuel_WoS_2019-top-1000_KW-co-occurrence.png
- Fuel_WoS_All_KW co-occueernce.png (All, 2015—2019)

KH Coder 3

Using file: Fuel_WoS_2015-2019_top-1000_all_Abstracts - took top 1000 abstracts by citations, left only letters and used such text for further analysis by KH Coder 3

Tokens (in use) 1193819 (585908); Sentences 49704; Paragraphs 5728

Table 14. TermExtract results for 100

Term	Scale	Term	Scale	Term	Scale
degrees c	426487.294	thermal efficiency	61726.296	adsorption capacity	35056.644
diesel fuel	336144.779	kinetic model	53180.581	gas adsorption	34302.713
experimental results	213401.011	catalytic performance	50714.174	heating rate	33850.971
reaction temperature	197534.285	high pressure	49928.582	engine load	33710.890
oil recovery	157566.353	equivalence ratio	48662.694	carbon conversion	33335.027
elsevier ltd	147474.707	ignition delay	48361.202	different temperatures	33220.833
experimental data	139972.070	activation energy	48272.129	oil production	32575.937
combustion process	135402.252	**coal** samples	47755.664	co2 emissions	32269.617
crude oil	132950.647	combustion performance	47576.501	co2 capture	32227.879
diesel engine	118249.268	heavy oil	47126.301	specific surface area	31799.652
injection pressure	100682.797	co2 injection	46893.812	biomass combustion	31251.683
temperature range	99747.943	low temperature	46585.574	combustion chamber	30959.885
combustion characteristics	94556.732	emission characteristics	46334.647	experimental study	30930.053
fuel properties	91337.360	surface area	46273.104	water content	30912.178
reaction time	90865.170	pore structure	46267.294	production of biodiesel	30768.516
high temperature	88008.660	catalytic activity	45668.325	flame temperature	29856.908
biodiesel production	84821.315	**coal** rank	44466.711	catalyst surface	29531.569
coal combustion	84447.798	oxygen content	43900.155	gas pressure	29151.842
particle size	83641.165	bituminous **coal**	43166.353	soot formation	29049.705
engine performance	82995.585	co emissions	42152.034	kinetic parameters	28755.044
flue gas	81820.195	simulation results	42148.425	chemical composition	28682.993
gas phase	81168.539	organic matter	42048.437	**hydrogen** production	28252.898
nox emissions	77271.590	oil shale	41868.286	heating value	27766.589
gas flow	75402.419	soot emissions	39751.331	co2 adsorption	27762.330
pyrolysis temperature	74581.677	present study	39591.708	oil phase	27605.552

Term	Scale	Term	Scale	Term	Scale
fuel temperature	72345.092	reaction rate	39205.252	**pyrolysis** process	27543.430
coal surface	71672.293	combustion temperature	38855.719	reaction conditions	27347.144
natural gas	71412.110	**diese**l engines	38687.188	model oil	27144.750
gas production	70732.026	**diesel** oil	37917.340	ash content	26837.427
gas temperature	62438.458	combustion efficiency	37025.790	carbon dioxide	26644.099

As before, coal, biodiesel, pyrolysis have a significant inclusion in the analyzed texts.

You can look through additional tables and graphs by direct link: https://figshare.com/s/59512f4f8f23619530ab or by DOI

References:

- Van Eck, N.J., & Waltman, L. (2010). Software survey: **VOSviewer**, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523-538.
- KH Coder 3: for Quantitative Content Analysis or Text Mining http://khcoder.net/en
- Direct link to figshare data: https://figshare.com

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