SciRad SCIENTIAE RADICES

Metal-organic frameworks for efficient drug adsorption and delivery

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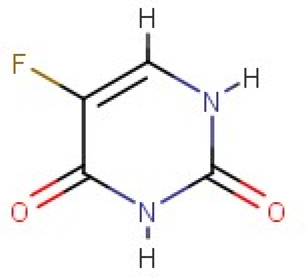
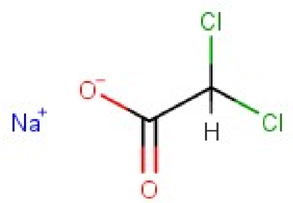
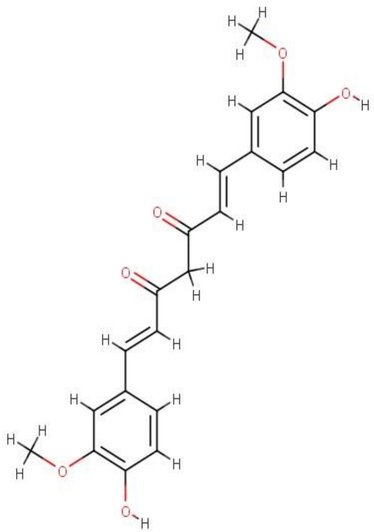
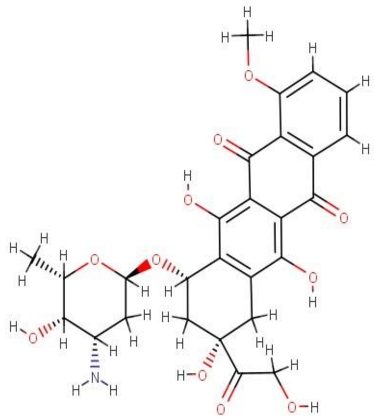
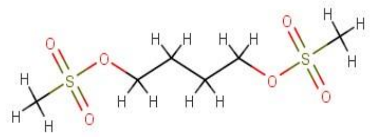
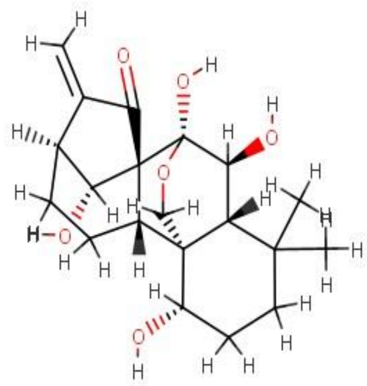
1. Anticancer drugs.

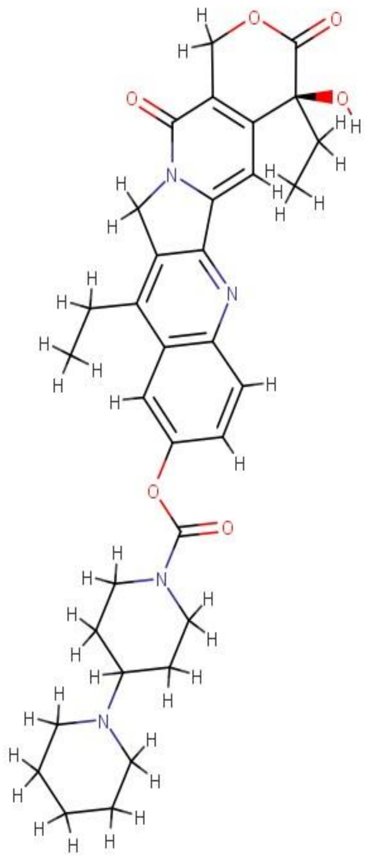
1.1. Drug Delivery System.

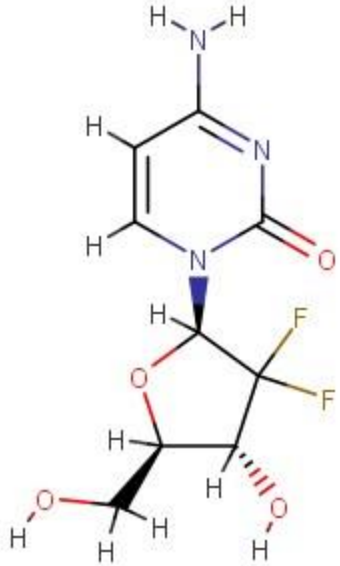
Table No.S1. Examples of anticancer drug delivery by metal-organic frameworks.

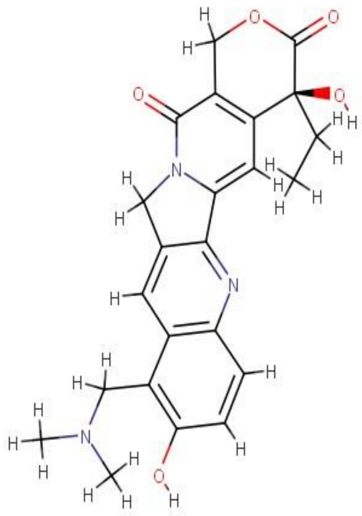
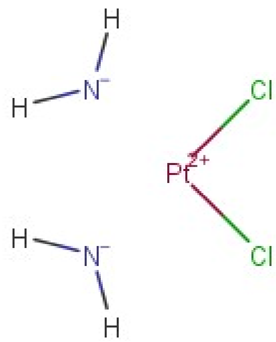
API	CAS number	Molar weight $[\frac{g}{mol}]$	Molecular formula	Structural formula	Metal-Organic Framework	Applications	Literature
5-fluorouracil (5-FU)	51-21-8	130.078	$C_4H_3FN_2O_2$		MIL-100 (Fe) HKUST-1 FOLA@NH_2-Eu:TMU-62 Zn-cpon-1 MOF-In1 MOF-In2 Fe-MIL53-NH_2 MIL-88 (Al) TDL-Mg MBM (Fe-MOF) MUT-2 $[Dy_2(L)_2(H_2O)_2]n$ UiO-66 Cu-MOF ZIF-90 ZIF-8	Tumors of the gastrointestinal tract	[1,2,10–13,3–9,9]
Sodium dichloroacetate (DCA)	2156-56-1	150.92	$C_2HCl_2NaO_2$		CAU-7 Zr-fum (UiO66) Folic acid coated-UiO66 UiO-66	Cancers of the breast, lung and brain	[14–18]

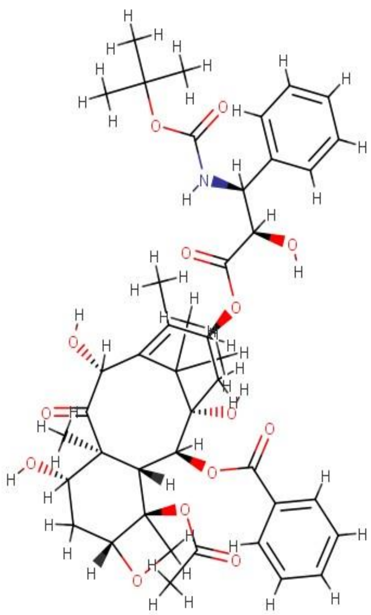
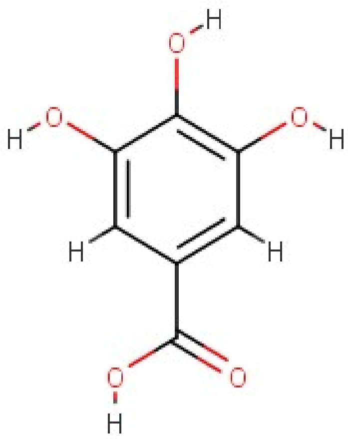
α-Cyano-4-hydroxycinnamic acid (α-CHC)	54673-07-3	189.17	$C_{10}H_7NO_3$		CAU-7 Folic acid coated-UiO66 UiO-66		[18,19]
Curcumin (CUR)	458-37-7	368.39	$C_{21}H_{20}O_6$		Zr-DTBA	Cancers of the skin, lung, gastrointestinal tract, head and neck, bladder, prostate, breast, cervix	[20–27]

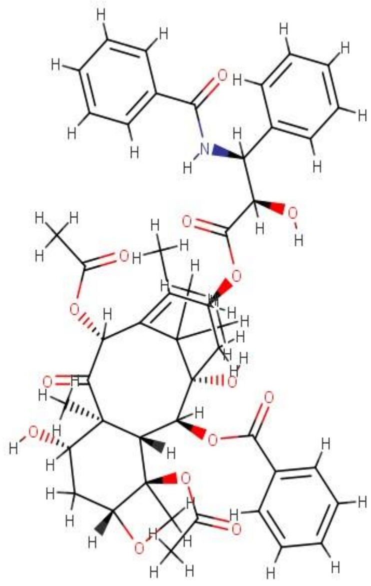
Doxorubicin (DOX)	23214-92-8	543.52	$C_{27}H_{29}NO_{11}$		IR-MOF-3 MIL-53 (Fe) MIL-100 (Fe) NH_2-UiO-66 MIL-100 (Al) DUT-32 ZIF-90	Cancers of the stomach, pancreas, prostate, testis, liver, kidney and cervix	[17,21,36–41,28–35]
Busulfan	55-98-1	246.30	$C_6H_{14}O_6S_2$		MIL-53(Fe) MIL-88A (Fe) MIL-89 (Fe) MIL-100 (Fe)	Cancers of the bone marrow and gastrointestinal tract	[42]
Oridonin (ORI)	28957-04-2	364.43	$C_{20}H_{28}O_6$		MIL-53 (Fe)	Cancers of the breast, thyroid	[43,43,44]

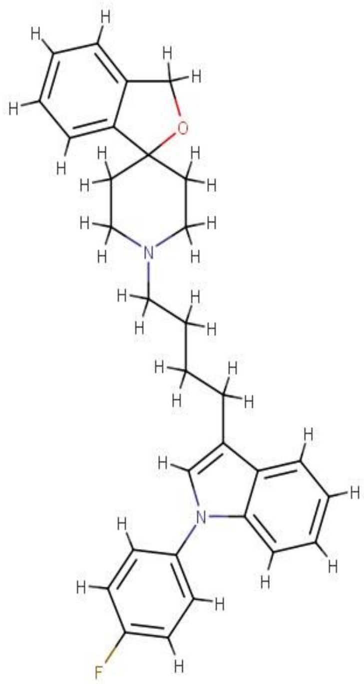
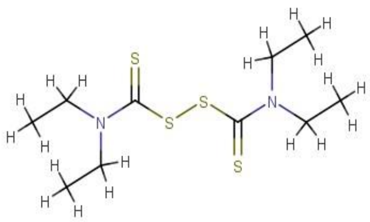
Irinotecan	97682-44-5	586.68	$C_{33}H_{38}N_4O_6$		MIL-88A (Fe)	Cancer of the colon and large intestine	[45]

Floxuridine	50-91-9	246.20	$C_9H_{11}FN_2O_5$		MIL-88A (Fe)	Colorectal cancer	[46]
Gemcitabine monophosphate (gemcitabine)	103882-84-4	263.20	$C_9H_{11}F_2N_3O_4$		MIL-100 (Fe)	Cancer of the lung, breast, ovary and bladder	[25,28,49–56,29,29,31,34,35,45,47,48]

Topotecan	123948-87-8	421.45	$C_{23}H_{23}N_3O_5$		MIL-100 (Fe)	Ovarian and lung cancer	[2,56,56–60]
Cis-platinum	15663-27-1	300.05	$PtCl_2(NH_3)_2$		Fe-MIL-101 UiO-66 UiO-66-NH_2	Cancer of the testicles, lungs, bladder, ovary, cervix, head and neck	[17,28,65,66,29,31,34,61,61–64]

Docetaxel (DTX)	114977-28-5	807.88	$C_{43}H_{53}NO_{14}$		Fe-BTC-3(H_2O)$_4$ MIL-100 (Fe)	Cancer of the breast and urethra	[67]
Gallic acid (GA)	149-91-7	170.12	$C_7H_6O_5$		Cu-GA (NMOF)	Prostate cancer	[33,68–71]

Paclitaxel (PTX)	33069-62-4	853.91	$C_{47}H_{51}NO_{14}$		Fe-BTC (Basolite®F300)	Cancers of the ovary, lung, head and neck	[31,72,73]

Siramesin (Sira)	147817-50-3	454.589	$C_{30}H_{31}FN_2O$		ZIF-8	CNS-acting drug with anticancer potential	[74]
Disulfiram (DSF)	97-77-8	296.54	$C_{10}H_{20}N_2S_4$		Cu-MOF	Lung and prostate cancer	[29,75]
Pyrrolidine dithiocarbamato gold(III) complex [(PDTC)Au(III)Cl$_2$]	-	-	-	-	ZnBTCA	Ovarian cancer	[63]

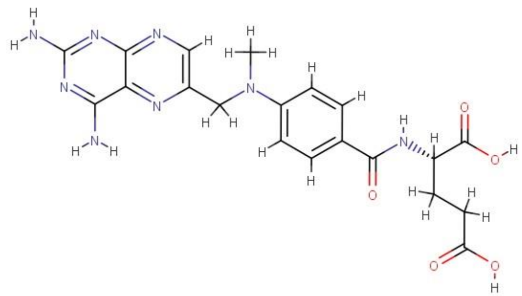
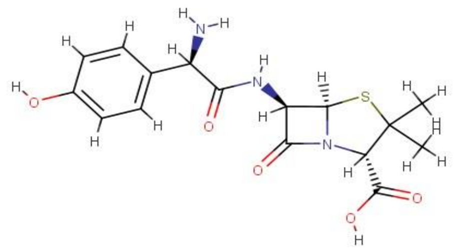
1.2. Drugs adsorption.

Table No.S2. Metal-organic frameworks for drug adsorption.

Drug	MOF	Adsorption efficiency $[\frac{mg}{g}]$	Literature
Curcumin (CUR)	UiO-66-NH_2 functionalized with glycidyl methacrylate (UiO-66-GMA) and UiO-66-NH_2 functionalized with ethylenediamine (UiO-66-EDA)	423.85 (for UiO-66-EDA) 384 (for UiO-66-GMA) 364 (for UiO-66-NH_2)	[27], [23]
Methotrexate (MTX)*	UiO-66-NH_2 functionalized with glycidyl methacrylate (UiO-66-GMA) and UiO-66-NH_2 functionalized with ethylenediamine (UiO-66-EDA) MIL-53 NH_2-MIL-53 NH_2-MIL-101	570.78 (for UiO-66-EDA) 450 (for UiO-66-GMA) 401(for UiO-66-NH_2) 374.97 (for MIL-53) 387.82 (for NH_2-MIL-53) 457.69 (for NH_2-MIL-101)	[27], [76]
Amoxicillin (AMX)*	DUT-32 MIL-53 (Al)	- 758.5	[77] [78]
5-fluorouracil (5-FU)	ZIF-8	477	[79]
Ibuprofen (IBP)	PCDM-1000 ZIF-8 ATP@ZIF-8-DETA	320 (for PCDM-1000) 29 (for ZIF-8) 218.34 (for ATP@ZIF-8-DETA)	[80], [81]
Diclofenac (DCF)	PCDM-1000 ZIF-8	-	[80]
Aspirin (ASA)	ATP@ZIF-8-DETA UiO-66	350.88 (for ATP@ZIF-8-DETA) 140 (for MIL-127)	[81]

	UiO-66-NH_2 MIL-127		
Ciprofloxacin (CIP)	Fe_3O_4/HKUST-1	538	[82]
Norfloxacin (NOR)	Fe_3O_4/HKUST-1	513	[82]

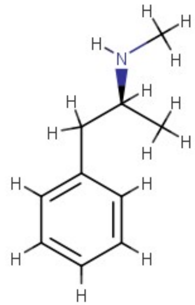
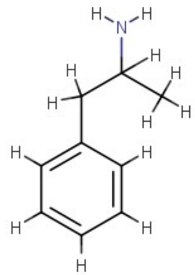
Table No.S3. Examples of oncology drugs adsorbed by MOF materials.

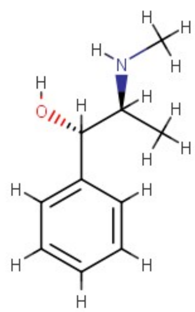
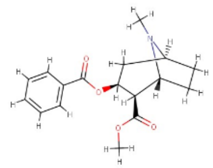
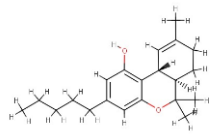
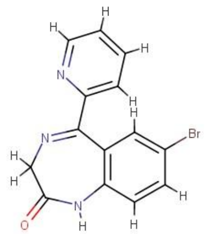
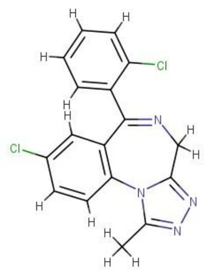
API	CAS number	Molar weight [$\frac{g}{mol}$]	Molecular formula	Structural formula	Applications	Literature
Metotrexat (MTX)*	59-05-2	454.44	$C_{20}H_{22}N_8O_5$		Ovarian cancer, lung cancer, leukemia, sarcomas	[23,27]
Amoxicillin (AMX)*	26787-78-0	365.40	$C_{16}H_{19}N_3O_5S$		-	[77,78]

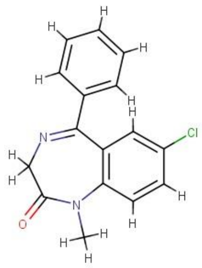
2. Psychoactive substances.

2.1. Psychoactive substances adsorbents *(Antidotial Agents)*.

Table No.S4. Metal-organic frameworks for psychoactive substances adsorptions.

Psychoactive substances	CAS number	Molar weight $[\frac{g}{mol}]$	Molecular formula	Structural formula	Metal Organic Framework	Literature
Methamphetamine	537-46-2	149.23	$C_{10}H_{15}N$		ZIF-8 HKUST-1	[83], [84]
Amphetamine	300-62-9	135.21	$C_9H_{13}N$		Fe_3O_4/GO/ZIF-8 HKUST-1	[85], [84]

Pseudoephedrine (PEP)	90-82-4	165.23	$C_{10}H_{15}NO$		HKUST-1	[84]
Cocaine (COC)	50-36-2	303.35	$C_{17}H_{21}NO_4$		HKUST-1	[84]
Tetrahydroxycannabinol (THC)	1972-08-3	314.46	$C_{21}H_{30}O_2$		Symulacja komputerowa różnych typów MOF	[86]
Benzodiazepines (bromazepam, triazolam and diazepam)	1812-30-2 28911-01-5 439-14-5	316.15 343.21 284.74	$C_{14}H_{10}BrN_3O$ $C_{17}H_{12}Cl_2N_4$ $C_{16}H_{13}ClN_2O$	 	MOF-808-SiO_2	[87]

MOFs have also found use as a detection agents. The literature describes examples of the use of MOFs for the detection of Amphetamine-type stimulants (ATS), more specifically, the detection of 3-phenylpropylamine (3-PPA) has been demonstrated [88].

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