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Partial coating of component with layer e.g. magnetic layer of metal-organic framework, by cleaning component and then annealing at specified temperature for specified duration, and functionalizing component with self-assembled monolayer

Patent Number(s): DE102011106668-A1 ; WO2013004726-A1

Inventor(s): [JEREMIAS F](#), [HENNINGER S](#), [JANIAK C](#)

Patent Assignee Name(s) and Code(s): FRAUNHOFER GES FOERDERUNG ANGEWANDTEN EV(FRAU-C)

Derwent Primary Accession Number: 2013-A43779 [06]

**Abstract:** NOVELTY - The process comprises cleaning a component (1) and then annealing at 110-130 degrees C for 20-28 hours, functionalizing the component with a self-assembled monolayer, and contacting the component to a residual solution (3) containing a metal salt, a linker and a solvent, where the metal salt is a precursor. The solution has a temperature gradient, where the temperature of the solution directly at a surface of the component allows a crystallization of a metal-organic framework (MOF)-layer on a surface of the component. The linker is a bidentate organic compound, and contains a functional group.

**USE** - The process is useful for partial coating of a component with a layer of a metal-organic framework, where the layer is a catalytic active layer, a luminescent layer, a magnetic layer, an analytical gas separation layer, and a continuous gas or liquid separation layer (claimed).

**ADVANTAGE** - The process allows effective and economical partial coating of the component with high quality and thermal stability and improved chemical and physical properties.

**DETAILED DESCRIPTION** - The process comprises cleaning a component (1) and then annealing at 110-130 degrees C for 20-28 hours, functionalizing the component with a self-assembled monolayer, and contacting the component to a residual solution (3) containing a metal salt, a linker and a solvent, where the metal salt is a precursor. The solution has a temperature gradient, where the temperature of the solution directly at a surface of the component allows a crystallization of a metal-organic framework (MOF)-layer on a surface of the component. The linker is a bidentate organic compound, and contains a functional group. A temperature at the surface of the component is adjusted by a temperature control device and adjusted to 88-150 degrees C using a temperature sensor (5). The temperature control device comprises an electrical heating element and/or a heat-carrier fluid that flows through the component. The solution has a temperature of 30-50 K, where the temperature of the solution is kept constant under the temperature at the surface of the component and is adjusted by a cooling device such as a cryostat and/or an ice-water bath. The precursor forms a porous framework structure, a zeolitic imidazole framework, a zeolite-based MOF and/or a zinc-based MOF. An INDEPENDENT CLAIM is included for a component.

**DESCRIPTION OF DRAWING(S)** - The diagram shows a schematic view of a process for partial coating of a component.

Additional information

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Component (1)

Metal-organic framework-layer (2)

Solution (3)

Tempering device (4)

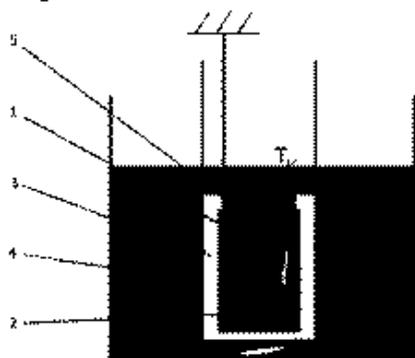
Temperature sensor. (5)

Technology Focus/Extension Abstract: TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Components: The component consists of metal such as copper, aluminum and steel of types 1.4301 and/or 1.4401, metal alloy, metal oxide, metal oxide ceramic, and non metal oxide ceramic such as silicon carbide, glass, semi-metals, alloy semiconductor and silicon. The porous framework structure is made of metal and/or semi-metal, where the metal comprises 2-15 group elements, lanthanides, copper, chromium, aluminum, iron, titanium, zirconium or zinc-MOF. ORGANIC CHEMISTRY - Preferred Components: The linker comprises: a nitrogen-heterocycle consisting of pyrazolate, triazolate, tetrazolate, imidazolate, pyrimidine, pyridazine and pyrazine; an aliphatic or aromatic amines; and/or a phosphine. The solution is acetone and/or dilute hydrochloric acid. The functional group is carboxylic acid (COOH), dithionic acid (CS<sub>2</sub>H), nitro (NO<sub>2</sub>) group, boric acid (B(OH)<sub>2</sub>) or sulfonic acid (SO<sub>3</sub>H).

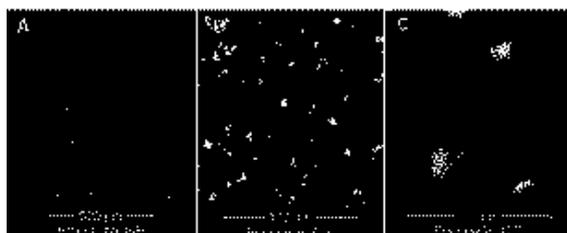
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Drawing:

**Figur 1**



**Figur 4**



International Patent Classification: B01J-031/12; B05D-007/24; C03C-025/38; B01J-020/02; B01J-020/28; B01J-020/32; C09K-005/04

Derwent Class Code(s): E13 (Heterocyclics); J04 (Chemical/physical processes and apparatus including catalysis); L01 (Glass including composition, forming, but not containers); L03 (Electro-(in)organic, chemical features of electrical devices); P42 (Spraying, atomising)

Derwent Manual Code(s): E05-C02; E07-D08; E07-D09B; E07-D10; E07-D12; E10-A09B5; E10-B04A2; E10-B04D; E10-C01; E10-C04J2U; E10-C04L; E10-G03D; E12-A04; E31-P02B; E34; E35; J04-E04; L01-B01; L01-F03A; L01-G02; L01-G11; L03-G09V; L03-H04A

Patent Details:

Patent Number	Publ. Date	Main IPC	Week	Page Count	Language
DE102011106668-A1	10 Jan 2013	B05D-007/24	201306	Pages: 14	German
WO2013004726-A1	10 Jan 2013	B01J-020/28	201306		German

Application Details:

DE102011106668-A1	DE10106668	05 Jul 2011
WO2013004726-A1	WOEP062987	04 Jul 2012

## Priority Application Information and Date:

DE10106668 05 Jul 2011

## Designated States:

WO2013004726-A1:

(National): AE; AG; AL; AM; AO; AT; AU; AZ; BA; BB; BG; BH; BR; BW; BY; BZ; CA; CH; CL; CN; CO; CR; CU; CZ; DE; DK; DM; DO; DZ; EC; EE; EG; ES; FI; GB; GD; GE; GH; GM; GT; HN; HR; HU; ID; IL; IN; IS; JP; KE; KG; KM; KN; KP; KR; KZ; LA; LC; LK; LR; LS; LT; LU; LY; MA; MD; ME; MG; MK; MN; MW; MX; MY; MZ; NA; NG; NI; NO; NZ; OM; PE; PG; PH; PL; PT; QA; RO; RS; RU; RW; SC; SD; SE; SG; SK; SL; SM; ST; SV; SY; TH; TJ; TM; TN; TR; TT; TZ; UA; UG; US; UZ; VC; VN; ZA; ZM; ZW

## Compound(s):

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184625-0-0-0	(K M Q)	45081-0-0-0	(K M Q)	80279-0-0-0	(K M Q)
35701-0-0-0	(K M Q)	2749-0-0-0	(K M Q)	294-0-0-0	(K M Q)
66598-0-0-0	(K M Q)	1229-0-0-0	(K M Q)	100006-0-0-0	(K M Q)
89847-0-0-0	(K M Q)	131354-0-0-0	(K M Q)	88362-0-0-0	(K M Q)
87087-0-0-0	(K M Q)	131407-0-0-0	(K M Q)	131408-0-0-0	(K M Q)
133481-0-0-0	(K M Q)	132931-0-0-0	(K M Q)	131923-0-0-0	(K M Q)
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130522-0-0-0	(K M Q)	130645-0-0-0	(K M Q)	131071-0-0-0	(K M Q)
131924-0-0-0	(K M Q)	130358-0-0-0	(K M Q)	133966-0-0-0	(K M Q)
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440746-0-0-0	(K M Q)	134276-0-0-0	(K M Q)	134622-0-0-0	(K M Q)
132853-0-0-0	(K M Q)	130767-0-0-0	(K M Q)	131246-0-0-0	(K M Q)
244192-0-0-0	(K M Q)	245649-0-0-0	(K M Q)	134987-0-0-0	(K M Q)
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132606-0-0-0	(K M Q)	133547-0-0-0	(K M Q)	131104-0-0-0	(K M Q)
133871-0-0-0	(K M Q)	131285-0-0-0	(K M Q)	135072-0-0-0	(K M Q)
135069-0-0-0	(K M Q)	200283-0-0-1	(K M Q)	135070-0-0-0	(K M Q)
131127-0-0-0	(K M Q)	200332-0-0-0	(K M Q)	200285-0-0-0	(K M Q)
252600-0-0-0	(K M Q)	205884-0-0-0	(K M Q)	135149-0-0-0	(K M Q)
252601-0-0-0	(K M Q)	252602-0-0-0	(K M Q)	135263-0-0-0	(K M Q)
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	USE)		USE)		USE)
130522-0-0-0	(CL RCT USE)	130645-0-0-0	(CL RCT USE)	131071-0-0-0	(CL RCT USE)
131924-0-0-0	(CL RCT USE)	130358-0-0-0	(CL RCT USE)	133966-0-0-0	(CL RCT USE)
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135069-0-0-0	(CL RCT USE)	200283-0-0-1	(CL RCT USE)	135070-0-0-0	(CL RCT USE)
131127-0-0-0	(CL RCT USE)	200332-0-0-0	(CL RCT USE)	200285-0-0-0	(CL RCT USE)
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252601-0-0-0	(CL RCT USE)	252602-0-0-0	(CL RCT USE)	135263-0-0-0	(CL RCT USE)

Markush Number:

Markush Number	Role	Markush Number	Role	Markush Number	Role
115107601	(K M Q)	115107602	(K M Q)	115107603	(K M Q)
115107604	(K M Q)	115107605	(K M Q)	115107606	(K M Q)
115107607	(K M Q)				

Ring Index Number(s):

00094 00061

Derwent Compound Number(s):

Compound Number	Role	Compound Number	Role	Compound Number	Role
R07707	(K M Q)	RA05LV	(K M Q)	R11191	(K M Q)
R01195	(K M Q)	R03184	(K M Q)	RA009V	(K M Q)
R01193	(K M Q)	R01194	(K M Q)	R01192	(K M Q)
R06645	(K M Q)	RA014O	(K M Q)	R10599	(K M Q)
R10661	(K M Q)	RA00NF	(K M Q)	R10662	(K M Q)
R10746	(K M Q)	R10747	(K M Q)	R16315	(K M Q)

R13747	(K M Q)	R11234	(K M Q)	RAWQU6	(K M Q)
R18793	(K M Q)	R10368	(K M Q)	R18795	(K M Q)
R06144	(K M Q)	R06944	(K M Q)	R06751	(K M Q)
R07107	(K M Q)	R07934	(K M Q)	R11235	(K M Q)
R06206	(K M Q)	R06421	(K M Q)	R11552	(K M Q)
R20698	(K M Q)	RA0YA7	(K M Q)	R13895	(K M Q)
RA4Z5F	(K M Q)	R19160	(K M Q)	R20488	(K M Q)
R13524	(K M Q)	R07373	(K M Q)	R10325	(K M Q)
RA0X51	(K M Q)	RA0YA8	(K M Q)	R22096	(K M Q)
RAY9B0	(K M Q)	R20487	(K M Q)	R15895	(K M Q)
R12939	(K M Q)	R16742	(K M Q)	R07473	(K M Q)
R18033	(K M Q)	R10427	(K M Q)	R22436	(K M Q)
R22432	(K M Q)	RA006I	(K M Q)	R22433	(K M Q)
R10029	(K M Q)	RA007E	(K M Q)	RA006J	(K M Q)
RA13I4	(K M Q)	RA048S	(K M Q)	R22811	(K M Q)
RA13I5	(K M Q)	RA13I6	(K M Q)	R23390	(K M Q)

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1192	(S)				

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