

# VIVO-based plasma knowledge graph for improving the discoverability of patent information in plasma science and technology

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### INTRODUCTION

- A significant part of the world's technical knowledge is documented in patents. This knowledge, encompassing the descriptions of technical procedures, chemical substances, methods, and processes, is crucial for addressing important technological and scientific questions and for the development of innovative solutions.
- Several studies indicate that this potential is often underutilized in the scientific community. The challenges seem to stem from the complexity and structure of patents themselves, as well as a lack of expertise in leveraging existing tools to search and analyze patent information effectively.
- Recent research activities aim to address these challenges by developing a patent-centric knowledge graph (PKG) based on a semantic data model for patents [1]. The PKG strives to facilitate the use of patents in scientific research by providing semantically enriched patent contents as well as the interlinking between patents and scientific literature and other domain-specific knowledge sources using explicit semantics from external knowledge graphs.
- To support the implementation of the PKG for use in plasma science and technology, a new platform for managing semantic information in this domain has been developed using the open-source software VIVO [2,3].

### **ONTOLOGY-BASED KNOWLEDGE MANAGEMENT**

### **Plasma ontology**

Formalizes concepts in the scientific domain

Establishes a common terminology in the LTP field

> Allows for semantic information retrieval

Increases the findability and reusability of data and knowledge in low-temperature plasma science and technology



### KNOWLEDGE GRAPH-BASED INFRASTRUCTURE FOR SEMANTIC INFORMATION RETRIEVAL

### **VIVO portal for plasma technology**

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- VIVO enables knowledge graph development based on internal ontologies and plasma ontology.
- Easy integration of new instance data for humans (web interface) and machines (APIs).
- User-friendly browsing of linked data connecting devices, applications, experts, literature etc.



### Patent4Science search portal

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OVERV	IEW				Inductively coupled plasma for polymer wafers	etching of 200 mm
	AIR DECONTAMINATION DEVICE & METHOD				Source: https://openalex.org/works/W2086150370	
8	Application Number: W02015-GB50362 - Patent Number: W0 2015121633				Shared Concepts  Plasma cell	WIKID
Patent	A device for air decontamination comprises a housing (10) having an air inlet (14), an air outlet (16) and an air flo (22);wherein the non-thermal plasma cell is sized and positioned relative to the internal dimensions of the housin through and across the non-thermal plasma cell and a portion of air entering the housing from the air inlet is ada decontaminating air is also disclosed.	w passage (12) therebetween, the housing including at least one non-thermal plasma g such that a portion of air entering the housing from the air inlet is adapted to pass oted to pass outside of the external surface of the non-thermal plasma cell. A method	of	┢┝	<ul> <li>Air inlet</li> </ul>	WIKI
					Electrostatically-Shielded Inductively-Co Source: https://openalex.org/works/W90219893	oupled RF Plasma Sou
	AIR DECONTAMINATION SYSTEM				Shared Concepts	
Patent	There is provided an air decontamination system (100). The air decontamination system (100) comprises a cond	uit for air (110), a pulse generator (130) and a plurality of plasma generation devices (	20).		Plasma cell	WIKI
	The pulse generator (130) is couplable to a power supply and configured to generate a first pulse having a first pi plasma generation devices (120) in the conduit (110). The plurality of plasma generation devices (120) is located (121) comprises a high voltage alectede (121) and a ground electrode (122) the electrodes (121, 122) coupled in	Ise width of a first predetermined time, thereby controlling airflow between the pluralit on two interior surfaces (111, 112) of the conduit (110). Each plasma generation devi- on the pulse generator (130) and a dialectic barrier (123) between the birb voltage.	y of ce		Non-thermal plasma	WIKI
	electrode (121) and the ground electrode (122). The electrodes (121, 122) coupled in electrode (121) and the ground electrode (122). The electrodes (121, 122) are configured to apply a voltage acros (123), thereby decontaminating surrounding air.	is the dielectric barrier (123) to generate a plasma on a surface of the dielectric barrier	- L		<ul> <li>Decontamination</li> </ul>	WIKI
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	PLASMA APPARATUS FOR BIOLOGICAL DECONTAMINATION AND STERILIZAT	ON AND METHOD FOR USE			Effect of capacitive coupling on inductiv	ely coupled fluoroca
8	Application Number: US2012-13411311 - Patent Number: US 20130064710				plasma processing	
Patent	A device having dielectric layer with opposite sides and a length. First and second electrodes are each on an opp source selectively provides a first voltage on the first electrode and a second voltage on the second electrode su	osite side of the dielectric layer and offset along the length of the dielectric layer. A vol	tage		Source. https://openatex.org/works/wzu/141/050	
	decontamination mechanism of adjacent air, and movement of the adjacent air along the dielectric layer. Original	an dat plasma lo generated along the alelectric layer, the plasma providing a			Shared Concepts     Plasma cell	WIK
					Air	WIK
Sc	ence-friendly access to	Patent 6 / 25 WO 2015121633	<b>•</b>			
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### SUMMARY

- The present contribution shows how VIVO is used with the plasma ontology Plasma-O to develop and maintain a knowledge graph providing the core conceptual knowledge from the plasma domain in human- and machine-readable form.
- This facilitates the comprehensive analyses and reuse of knowledge contained in patent and enables the direct linking of patents with research data, scientific literature, and other information sources.

### REFERENCES

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