Porous material Analysis Toolbox - Open source

Berichterstattung

Projektinformationen

PATO

ID Finanzhilfevereinbarung: 753412

Projektwebsite

DOI
10.3030/753412

Das Projekt endete am 17 Januar 2019

EK-Unterschriftsdatum
15 März 2017

Startdatum
1 Januar 2018

Enddatum
31 Dezember 2019

Finanziert unter
EXCELLENT SCIENCE - Marie Skłodowska-Curie Actions

Gesamtkosten
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EU-Beitrag
€ 185 076,00

Koordiniert durch
ECOLE NATIONALE SUPERIEURE D'ARTS ET METIERS
France

Periodic Reporting for period 1 - PATO (Porous material Analysis Toolbox - Open source)

Berichtszeitraum: 2018-01-01 bis 2019-12-31

Zusammenfassung vom Kontext und den Gesamtzielen des Projekts

"The objective of the project is to advance fundamental science in reactive porous material modeling to foster innovation on the second pillar of the work program ""Leadership in Enabling and Industrial Technologies"". Starting from the most advanced development done at NASA in the last decade,

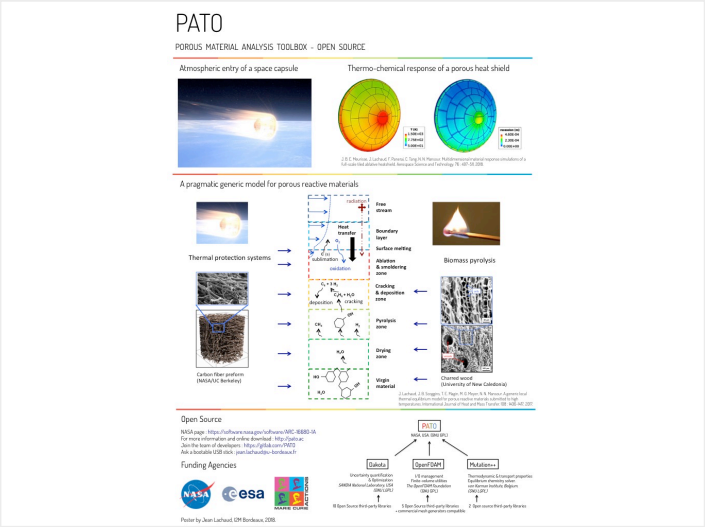
state-of-the-art reactive porous material models will be improved further with the contribution of expert theoreticians and implemented in a simulation tool released open source. The fundamental developments will be validated and applied to design optimization and process innovation for two industrial applications. The first one is the design of efficient and optimized thermal protection systems for space exploration vehicles (subprogram ""space""). The second one targets bio-hydrocarbon and bio-carbon production from lignocellulosic biomass. The biomass pyrolysis process will be studied from the wood-cell scale to the process level. The goal is to develop advanced predictive engineering tools to enable process optimization and guide innovation in progress. This second effort will eventually benefit to two ""Societal Challenges"" of the work program: ""Energy"" and ""Climate action, environment, resource efficiency, and raw materials""."

Arbeit, die ab Beginn des Projekts bis zum Ende des durch den Bericht erfassten Berichtszeitraums geleistet wurde, und die wichtigsten bis dahin erzielten Ergebnisse

During the duration of the project (one year), the most challenging topic encountered in the field of reactive porous materials has been addressed : coupling between materials and their environment. We have derived the mathematical model to couple reactive porous materials with their surrounding environments. The model has been implemented in the Porous material Analysis Toolbox based on OpenFoam (PATO, www.pato.ac) and released Open Source. A first validation study is proposed in the frame of the AeroThermoDyanmic test case 3 (ATD3) of the European Space Agency. Perfect agreement is obtained with experimental data when using a chemical equilibrium model for the environment. This test-case is available open source as a tutorial in PATO.

Fortschritte, die über den aktuellen Stand der Technik hinausgehen und voraussichtliche potenzielle Auswirkungen (einschließlich der bis dato erzielten sozioökonomischen Auswirkungen und weiter gefassten gesellschaftlichen Auswirkungen des Projekts)

During the course of the project (Jan-Dec 2018), an effort has been made to create bridges between diverse communities challenged by pyrolyzing reactive material behaviors. As a first step towards uniting our forces, a von Karman Institute Lecture series has been organized on the topic of “Pyrolysis phenomena in porous materials”, April 1-4, 2019, with the participation of three active communities (thermal conversion of biomass in biofuel, fire protection, thermal protection systems for space vehicles) : www.vki.ac.be/pyrolysis_phenomena
A generic test-case has been designed, and the three communities will now start working together on fundamental experimental and theoretical developments.
An enhanced impact from these communities - involved in solving societal challenges - is expected thanks to their active scientific collaboration.



Poster on PATO project

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