TITLE : Volumetric absorber structures: taking over from past developments to optimal geometries

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Abstract:

Porous structures have been used both as thermal receivers and as catalyst devices in reactors for high solar concentration technologies. After development of a huge variety of examples, including different materials (metallic, ceramics,) geometrical typologies (wire mesh, honeycomb or channels, etc.) and development of demonstration projects (as Phoebus TSA, SOLAIR, REFOS-SOLGATE,. Etc), the volumetric receiver technologies continue having room for new developments, in several fields/aspects:

1. Optimization of the relationships among: (material choice)/(3D geometry and relation to the concentrator)/(performance)/(modularity & scalability)
2. Answering to specific questions related with heat & mass transfer inside the structure (as flow instabilities, effective heat transfer coefficient, etc.)
3. Improved design and simulation tools for optimization of the absorber geometries (maximizing, for a selected operating temperature –and 3D distribution- the thermal and overall energy efficiency –this implies to minimize the pressure drop, …-).
4. "Adequate" empirical validation of modelling included in the design tools. This is understood as equilibrium between the model complexity and the experimental complexity.

The doctoral student has finalised the obligatory doctoral courses and afforded several preparatory works, for the thesis, including:

- A first modelling phase to answer the question: *How much could contribute a selective coating in the thermal efficiency of a volumetric absorber*?
- First works to setup a solar simulator (using a 4 kW Xenon lamp) as test bed for volumetric samples together with other experimental capabilities for the thesis purposes,
- Focusing the goals for the thesis to contribute in the above items 1 to 4, by a literature review, implementing a first modelling phase as software application, etc.

Actual results of this preparatory phase will be presented at the Colloquium.