UNIVERSITE SIDI MOHAMED BEN ABDELLAH
FACULTE DES SCIENCES ET TECHNIQUES - FES
Centre d'Etudes Doctorales : Sciences et Techniques de l'Ingénieur

N° d'ordre: ***19/2015***

THESE DE DOCTORAT

Présentée par

Amine ALLOUHI

Spécialité: **Génie Energétique**

Sujet de la thèse : **Solar cooling : A focus on adsorption technology**

Formation Doctorale : **Sciences de l'ingénieur Sciences Physiques, Mathématiques et Informatique.**

Thèse présentée et soutenue le Samedi 10 octobre 2015 à 11h à l'amphi Al Khawarizmi devant le jury composé de :

Nom Prénom	Titre	Etablissement	
Ali BENBASSOU	PES	Ecole Supérieure de Technologie de Fès	Président
Bouchaib HARTITI	PES	Faculté des Sciences et Techniques de Mohammedia	Rapporteur
Mahjoub BEN GHOULAM	PES	Faculté des Sciences de Meknès	Rapporteur
Abdellah MECHAQRANE	PES	Faculté des Sciences et Techniques de Fès	Rapporteur
Tarik KOUSKSOU	PH	ENSAM de Meknès	Examinateur
Kamar OUAZZANI	PH	Ecole Supérieure de Technologie de Fès	Examinateur
Youssef MOURAD Abdelmajid JAMIL	PES PH	Ecole Supérieure de Technologie de Fès Ecole Supérieure de Technologie de Fès	Directeurs de thèse

Badr IKKEN	Institut de Recherche en Energie Solaire et Energies Nouvelles	Invité

Laboratoire: **Productique, Energie et Développement Durable**

Etablissement: **Ecole Supérieure de Technologie de Fès**

ABSTRACT

This work covers three dimensions. The first is general, in which the aim is to provide a clear picture on solar cooling options, discuss the most important cycles, give a general outlook on the market situation and present the latest developments of the most promising technologies. The second dimension concerns the study of a particular cycle in detail: the solar adsorption technology belonging to closed sorption cycles. These cycles have increasingly demonstrated an attractive potential as they can use a clean energy source and can operate with environmentally safe working pairs. The adsorption cycles are characterized by the absence of corrosion, crystallization and vibration problems. They allow a simple control and have relatively low operating and maintenance costs. Furthermore, these technologies can be driven by low grade thermal energy. Solar energy seems an interesting option for such cycles, especially since the peak of cooling loads coincides generally with the availability of solar radiation. In this context, the second dimension of this work consists on (i) the study of adsorption with highlights on the most successful theoretical models describing the phenomenon, (ii) the selection of optimum working pairs according to the application (air conditioning, food and medicines storage and ice making) based on a multidimensional comparative study covering energy. economic and environmental aspects, (iii) the dynamic simulation and the performance analysis of a solar adsorption cooling system according to the Moroccan context. The third dimension of this thesis discusses the economic and environmental evaluation of the integration of solar cooling technologies for air-conditioning purposes in the Moroccan residential sector. A deep analysis is performed under different scenarios in order to assess the potential of this alternative in Morocco, to identify possible obstacles that may oppose it and propose the policy implications facilitating its emergence.

Keywords: Solar energy, cooling, adsorption, simulation, performance, environment

TABLE OF CONTENT