



An overview of the main Tunisian scientists in Chemistry and Materials Science

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Abstract

In this research paper, a ranking of the 61 main Tunisian scientists in chemistry and materials science working in Tunisia and abroad is provided. It is clearly seen that 37 out of 61 scientists are working in Tunisia and this is explained by the tendency of Tunisian universities having to work on interdisciplinary research that is known for providing more citations than theoretical and applied research. However, the performance of the Tunisian main scientists working abroad appears superior to the one of the local Tunisian main scientists. This is explained by the better conditions of research offered outside Tunisia and maybe by a deficiency in their choice of international collaboration. A new policy should then be elaborated to improve the organization of such research collaborations and let them more fruitful.

Keywords: Citation Analysis, Tunisia, Main Scientists, Hirsch Index

1. Introduction

Nowadays, there is an increasing interest in assessing and analyzing the performance of scientists, institutions, countries, regions and even of the overall scientific community in doing research in chemistry and materials science in order to increase their awareness about their current situation and incite them to improve the quality of their research output [1]. In fact, there were several international works dealing with the citation performances of countries since the 1980s [2-7]. These works involved an overview about the productivity, the quality, the fields of research and the international collaborations of researchers working in Tunisia. Since 1990, several works dealing with the scientific performance of more limited areas began to appear. These works are dealing either with African countries [8-10] or with Arab countries [1,11]. Further than giving an overview about the situation of chemistry research in Tunisia, these researches had tried to explain the results and give solutions to problems.

Since 2006, works began analyzing the scientific performance of a given developing country. More detailed overview about the collaborations of Tunisia with several emerging countries like India [12] and Morocco [13]. These papers tried even to compare the collaborations of Tunisia with developed countries to the ones of their countries and give the reasons of their differences.

Although there are some studies dealing with the research performances of Tunisia, there are limited trials to analyze the research performance of scientists in chemistry and materials science in Maghreb [14].

In this research paper, a list of the main Tunisian scientists in chemistry and materials science working in Tunisia and abroad would be given and analyzed in order to evaluate the situation of scientific research in the field of chemistry and materials science in Tunisian universities and eventually the reasons of deficiencies.

2. Results and Discussion:

The situation of scientific research on chemistry and materials science in Tunisia is critical as 61 Tunisian scientists only have a Hirsch Index superior or equal to 18. This number is considered limited when comparing to number of local scientists having a Hirsch Index superior or equal to 18 in several emerging countries like Turkey [15].

Among these Tunisian scientists, only 24 of them are working abroad as shown in Table 1. However, these scientists are working in all the fields of chemistry and materials science and have important values of Hirsch Index. This is mainly explained by the better conditions to perform top-level research offered outside Tunisia [16-17].

Table 1: Ranking of Tunisian scientists working abroad according to their general Hirsch index

Rank	Surname	Forename	Institution	Country	Field (Number of the GS indexed publications)	Hirsch Index	
1	Bawendi	Moungi	Massachusetts Institute of Technology	United States	Materials Science (N=685)	129	105
2	Sayari	Abdelhamid	University of Ottawa	Canada	Chemistry (N=289)	67	45
3	Mattoussi	Hédi	Florida State University	United States	Multidisciplinary Chemistry (N=260)	66	54
4	Karrai	Khaled	Attocube Systems AG, Munich	Germany	Condensed Matter Physics (N=189)	45	31
5	Dkhil	Brahim	CentraleSupélec, CNRS Chatenay Malabry	France	Condensed Matter Physics (N=216)	43	35
6	Belgacem	Mohamed Naceur	Grenoble INP	France	Polymer Science (N=273)	42	37
11	Bergaya	Faiza	Université d'Orléans	France	Physical Chemistry (N=143)	30	22
13	Mathlouthi	Mohamed	Université de Reims Champagne-Ardenne	France	Physical Chemistry (N=155)	29	15
15	Haouas	Mohamed	CNRS Institut Lavoisier de Versailles	France	Physical Chemistry (N=103)	27	22
16	Nefzi	Adel	Torrey Pines Institute for Molecular Studies	United States	Medicinal Chemistry (N=159)	27	16
19	Karoui	Romdhane	Université d'Artois	France	Food Chemistry (N=90)	26	20
21	Karoui	Hakim	Université Aix Marseille, Marseille	France	Multidisciplinary Chemistry (N=59)	25	16
23	Azria	Roger	Université de Paris Sud, Orsay, Paris	France	Physical Chemistry (N=150)	24	10
24	Mlayah	Adnen	Université Paul Sabatier Toulouse	France	Condensed Matter Physics (N=116)	23	18
29	Kooli	Fathi	AIST Tsukuba	Japan	Physical Chemistry (N=64)	22	11
31	Hochlaf	Majdi	Université Paris-Est	France	Physical Chemistry (N=259)	21	15
38	Jouini	Noureddine	Université de Paris XIII	France	Multidisciplinary Materials Science (N=124)	20	17
39	Belgacem	Saïd	Qassim University	Saudi Arabia	Multidisciplinary Materials Science (N=68)	20	17
45	El Mir	Lassaad	Al Imam Mohammad Ibn Saud Islamic University	Saudi Arabia	Condensed Matter Physics (N=134)	19	18
47	Braham	Chedly	CNRS ENSAM Centre Paris	France	Multidisciplinary Materials Science (N=179)	19	16
49	Jouini	Mohamed	Université de Paris VII	France	Physical Chemistry (N=103)	19	15
50	Dammak	Hichem	CentraleSupélec, CNRS Chatenay Malabry	France	Condensed Matter Physics (N=83)	19	13
53	Bouajila	Jalloul	Université Paul Sabatier Toulouse	France	Food Chemistry (N=59)	18	17
59	Lakhdar	Sami	CNRS ENSI Caen	France	Organic Chemistry (N=43)	18	15

As for the Tunisian scientists working in Tunisia, they are 37 scholars as shown in Table 2.

Their rate (60.65%) is superior to the one of the overall range of main Tunisian scientists as computed in December 2014 (52.78%) [17]. This important performance is explained by the fact that Tunisian universities are working of interdisciplinary research about chemistry and materials science [18]. In fact, 24 of the 26 local main scientists are working on interdisciplinary research. Furthermore, this is also clear when seeing that many of the 7384 Thomson Reuters Web of Science Core Collection indexed papers in the field of chemistry and materials science issued by Tunisian universities from 1996 until 2015 are dealing with another research area other than chemistry and materials science as shown in Table 3.

Table 2: Ranking of Tunisian scientists working in Tunisia according to their general Hirsch index

Rank	Surname	Forename	Institution	Country	Field (Number of the GS indexed publications)	Hirsch Index	
7	Gargouri	Youssef	Université de Sfax	Tunisia	Biochemistry (N=211)	39	22
8	Zarrouk	Mokhtar	Université de Carthage	Tunisia	Food Chemistry (N=152)	31	26
9	Boufi	Sami	Université de Sfax	Tunisia	Polymer Science (N=129)	30	27
10	Attia	Hamadi	Université de Sfax	Tunisia	Food Chemistry (N=123)	30	27
12	Marzouk	Brahim	Université de Carthage	Tunisia	Food Chemistry (N=233)	29	28
14	Hammami	Mohamed	Université de Monastir	Tunisia	Food Chemistry (N=311)	28	26
17	Dhahbi	Mahmoud	Université de Carthage	Tunisia	Chemistry (N=112)	26	23
18	Abdelghani	Adnane	Université de Carthage	Tunisia	Materials Science (N=100)	26	21
20	Ben Ouada	Hafedh	Université de Monastir	Tunisia	Multidisciplinary Materials Science (N=163)	26	17
22	Ghorbel	Abdelhamid	Université de Tunis Manar	Tunisia	Physical Chemistry (N=319)	24	19
25	Rezig	Bahri	Université de Tunis Manar	Tunisia	Multidisciplinary Materials Science (N=90)	23	18
26	Trabelsi Ayadi	Malika	Université de Carthage	Tunisia	Multidisciplinary Materials Science (N=212)	23	16
27	Besbes	Souhail	Université de Sfax	Tunisia	Food Chemistry (N=140)	22	21
28	Amlouk	Mosbah	Université de Tunis Manar	Tunisia	Multidisciplinary Materials Science (N=130)	22	21
30	Monser	Lotfi	Université de Tunis Manar	Tunisia	Analytical Chemistry (N=56)	21	18
32	Daoud	Abdelaziz	Université de Sfax	Tunisia	Physical Chemistry (N=187)	21	09
33	Amri	Hassen	Université de Tunis Manar	Tunisia	Organic Chemistry (N=114)	21	09
34	Bouaziz	Mohamed	Université de Sfax	Tunisia	Food Chemistry (N=106)	20	19
35	Bougatef	Ali	Université de Sfax	Tunisia	Food Chemistry (N=84)	20	19
36	Boubaker	Karem	Université de Tunis Manar	Tunisia	Physical Chemistry (N=192)	20	19
37	Dhahri	Essebti	Université de Sfax	Tunisia	Condensed Matter Physics (N=197)	20	17
40	Férid	Mokhtar	Université de Carthage	Tunisia	Crystallography (N=184)	20	16
41	Mhiri	Tahar	Université de Sfax	Tunisia	Inorganic Chemistry (N=225)	20	14
42	Khemakhem	Hamadi	Université de Sfax	Tunisia	Physical Chemistry (N=114)	20	14
43	Kbir Ariguib	Najia	Université de Tunis Manar	Tunisia	Physical Chemistry (N=101)	20	14
44	Bouchriha	Habib	Université de Tunis Manar	Tunisia	Applied Physics (N=199)	20	12
46	Srasra	Ezzeddine	Université de Carthage	Tunisia	Multidisciplinary Materials Science (N=122)	19	18
48	Dachraoui	Mohamed	Université de Tunis Manar	Tunisia	Environmental Chemistry (N=128)	19	15
51	Jemni	Abdelmajid	Université de Monastir	Tunisia	Physical Chemistry (N=83)	18	18
52	Askri	Faouzi	Université de Monastir	Tunisia	Physical Chemistry (N=63)	18	18
54	Ksibi	Mohamed	Université de Sfax	Tunisia	Environmental Materials Science (N=53)	18	17
55	Romdhane	Mehrez	Université de Gabès	Tunisia	Food Chemistry (N=58)	18	16
56	Feki	Mongi	Université de Sfax	Tunisia	Environmental Chemistry (N=54)	18	16
57	Elhouichet	Habib	Université de Tunis Manar	Tunisia	Multidisciplinary Materials Science (N=88)	18	15
58	Triki	Ezzeddine	Université de Tunis Manar	Tunisia	Multidisciplinary Materials Science (N=83)	18	15
60	Bennaceur	Raouf	Université de Tunis Manar	Tunisia	Condensed Matter Physics (N=181)	18	13
61	Kallel	Abderrazek	Université de Tunis Manar	Tunisia	Multidisciplinary Materials Science (N=114)	18	11

The geographic distribution of the main local Tunisian Scientists can be explained by the little performance of most of the Tunisian Universities as most of the publications are written by the Universities of Sfax, Tunis Manar, Carthage and Monastir as shown in Fig. 1.

The disciplinary distribution of the main local Tunisian scientists can be explained by the lack of publication in several fields of chemistry and materials science as Tunisian local main scientists are mostly affiliated to the main research areas of publication of the Tunisian universities as shown in Table 4.

Table 3: Distribution of interdisciplinary researches by Research Areas

Research Areas	Number of Publications
Physics	1703
Engineering and Computer Science	1355
Agriculture and Environmental Science	186
Biological and Medical Sciences	543
Geology	90
Mathematics	35

Figure 1: Distribution of the publications according to the affiliation of their authors

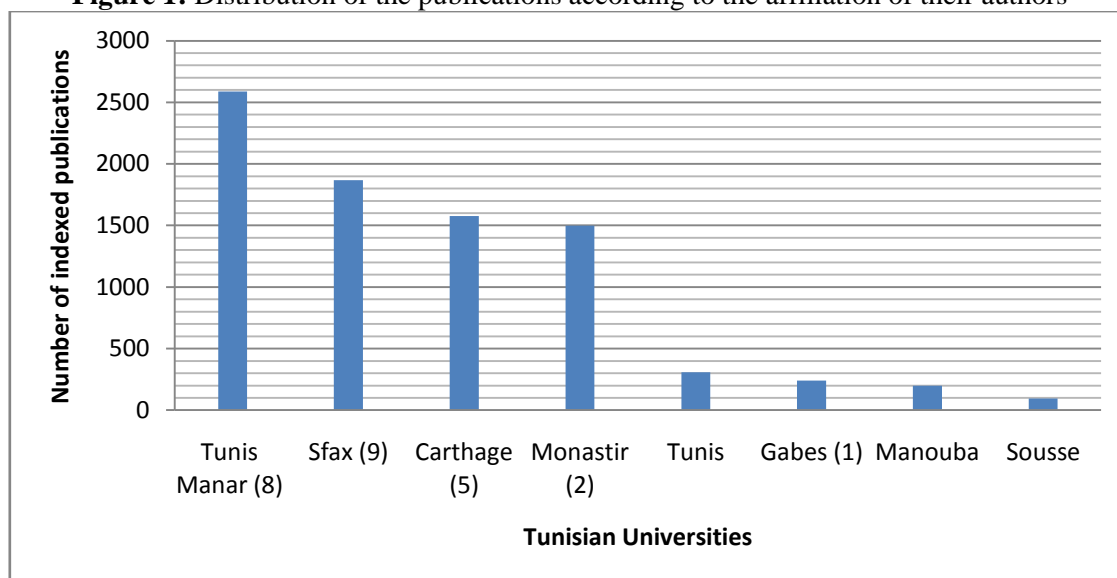


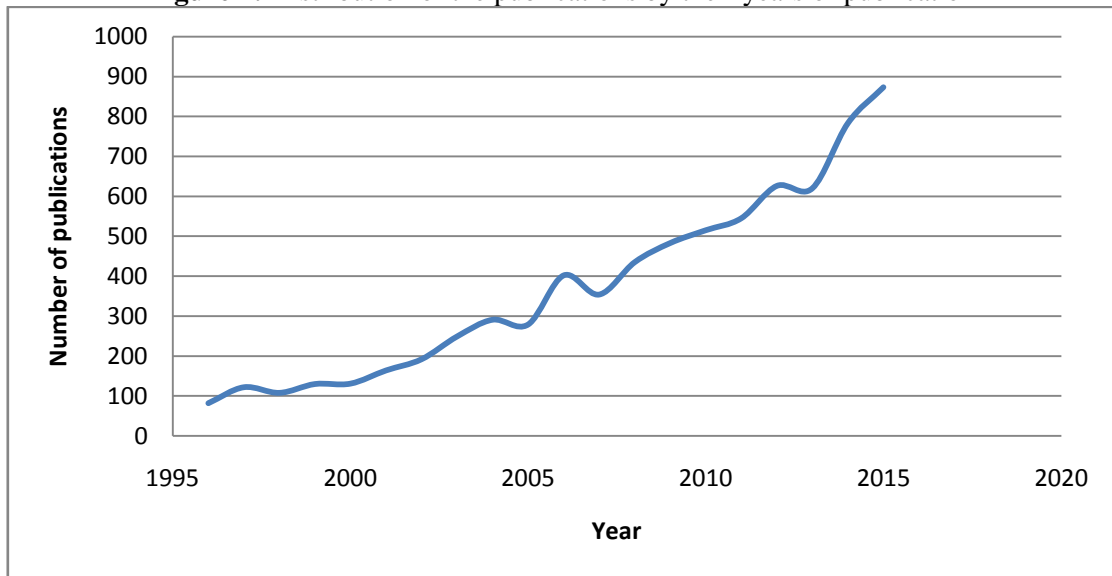
Table 4: Distribution of the publications and the local Tunisian main scientists according to their research areas

Research Area	Number of Publications	Number of Tunisian local Main Scientists
Multidisciplinary Materials Science	2772	9
Physical Chemistry	1850	7
Condensed Matter Physics	1029	2
Applied Physics	893	1
Multidisciplinary Chemistry	878	9
Applied Chemistry	715	2
Inorganic Nuclear Chemistry	514	1
Polymer Science	505	1

Even if the number of local Main scientists is slightly superior to the number of the main scientists working abroad, their Hirsch Index is only equal or less than 39 as shown in Table 2. This performance is considered as limited when comparing it to the performance of the Tunisian scientists working abroad and even to the performance of several local scientists in developing countries [15-16].

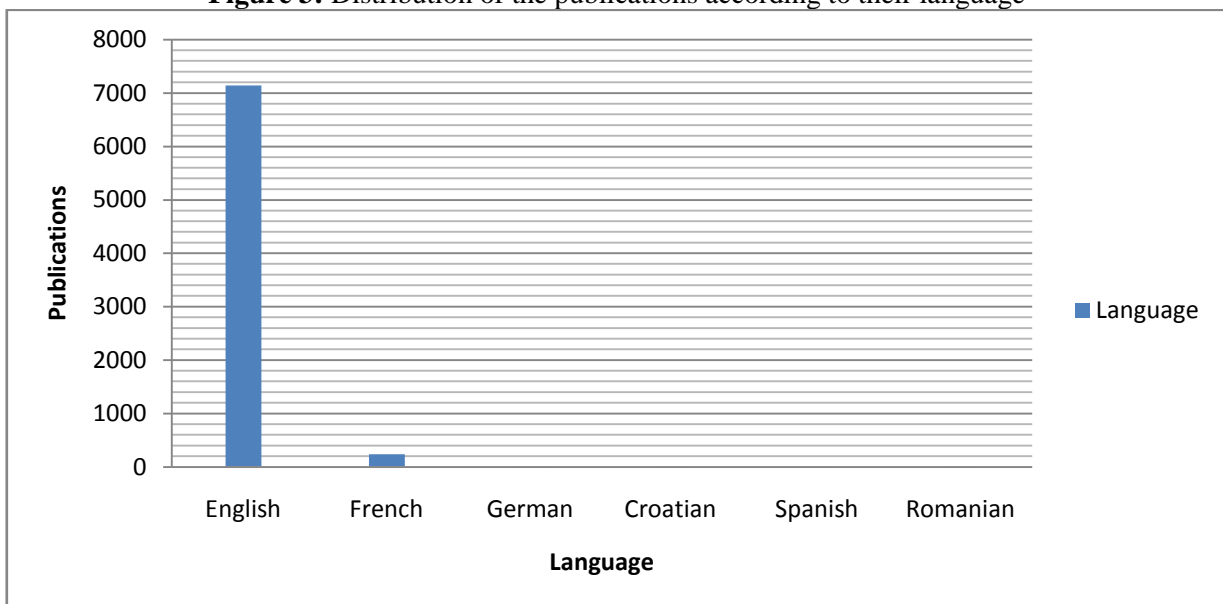
This is not explained by a lack of publication as 7384 publications had been issued by Tunisian Universities in Thomson Reuters Web of Science Core Collection indexed journals and conferences between 1996 and 2015 (Distributed as 6857 articles, 924 proceedings and 107 reviews) and as the number of publication per year is increasing over years as shown in Fig. 2.

Figure 2: Distribution of the publications by their years of publication



This lack of efficiency is not also explained by the language of the publications as 7142 of them are written in English as shown in Fig. 3.

Figure 3: Distribution of the publications according to their language



However and as 4430 out of 7384 publications are written with collaborations from outside Tunisia, the choice of the international collaborations in research can influence the performances of the scientists as well as the ones of institutions and of the country. This fact has been confirmed in many studies [19-20]. However, the choice of collaborations does not seem to be proportional to the number of citations received by the regions and the impact of the works of each of the regions as shown in Table 5.

In fact, there is an excess of collaborations of Tunisian universities and scientists with Western Europe and even with several regions with minor effect like Middle East and North Africa due to several political (historical relationship with Europe and mainly with France) and personal (research funding and conditions) purposes [22]. However, there is a lack of collaborations with several regions with important scientific effect like Far East [21,23] and North America [21,24].

Table 5: Distribution of the international collaborations involving Tunisian universities according to the regions

Region	Number of Collaborations	Received Citations [21]
Western Europe and Turkey	4181	22869584
Middle East	317	176372
North Africa and Egypt	231	322232
North America	212	16703019
Far East	113	13138190
URSS and Eastern Europe	100	2055947
South and Central Africa	72	204538
Central Asia	42	2196076
South America	19	1060236
Oceania	7	1127904

This idea is confirmed when seeing the distribution of the international collaborations according to countries as shown in Table 6.

Table 6 : Distribution of the international collaborations involving Tunisian universities according to countries

Country	Number of Collaborations	Ranking according to Citations [21]
France	3291	6
Saudi Arabia	263	39
Spain	247	9
Italy	166	11
Belgium	114	21
United States	108	1
Portugal	107	24
Canada	99	12
Morocco	97	52
Germany	93	4
Algeria	67	54
Egypt	58	25
Tunisia		55

In fact, France is the leading collaborative country with 3291 collaborations in the papers issued by Tunisian universities from 1996 to 2015. However, there is a lack of collaboration with countries that are better ranked than France in the field of chemistry and materials science like United States, China and Japan and even like several European countries like United Kingdom and Germany. This is mainly explained by the fact that the main active Tunisian diaspora in chemistry research exists in France as 16 out of 24 main scientists abroad are found to be in France as shown in Table 1 and by the absolute association of Tunisian universities to French universities in the FP-R&D projects funded by the EU as FP6, FP7 and later H2020 [25]. It is also explained by the cultural and historical relationship between Tunisia and France as this led Tunisian researchers in chemistry to be closer to France than to any other country [13].

The rate of collaboration with France for chemistry is superior the overall rate of French collaboration of Tunisia as described by Bouabid et al. reporting that there are 3025 collaborations between Tunisia and France in writing Thomson Reuters Web of Science indexed scientific articles between 1997 and 2006 (35% of the total Tunisian indexed articles) [13]. This excess of collaboration with France is reducing the effect of Tunisian works done through international collaboration due to the considerable limited audience of the French research output [21] although this can result in the creation of high quality papers [13]. Associating a part of the

collaboration with French universities as well as the collaboration with Middle East and North Africa to collaborations with leading universities from United States, Japan, China and Germany and doing more efforts to establish projects with these countries will provide Tunisian output with more audience and then with more citations.

3. Methods:

The ranking of Tunisian scientists is done using Google Scholar and Google Scholar Name Disambiguation as of 01 November 2015. Scientists are considered to be working on chemistry and materials science if they have at least eight Thomson Reuters Web of Science Core Collection indexed papers in the field of chemistry and materials science and if chemistry or materials science is their first, second or third published research area in indexed journals and conferences of Thomson Reuters Web of Science Core Collection. Scientists are ranked according to their h-index and scientists with the same h-index are classified according to their Google Scholar Since 2010 Hirsch Index.

- The h-index as created by Jorge E. Hirsch in 2005 is defined such that a scientist has a h-index of h if h of his works are cited h times each or more and his other works are cited h times each or less [26]. It is adopted in this study to emphasize the main Tunisian scientists working about chemistry and materials science as it assesses the quality and the quantity of research productivity of a given scientist in the same time [26].
- The Google Scholar Since 2010 Hirsch Index is defined such that a scientist has a Google Scholar Since 2010 h-index of h if h of his works are cited h times each or more since 2010 and his other works are cited h times each or less since 2010 [27]. This index reflects the current reputation of a given scientist.

As for the data about the publications of Tunisian universities in indexed journals and conferences in chemistry and materials science, it is provided using the Web of Science Core Collection Database and Web of Science Website as provided by Thomson Reuters IP and Science in 15 November 2015.

Conclusion

Tunisian Universities should improve their choice of international collaborations in chemistry and materials science and by that adjust significantly the quality of their ideas and fields of research [28] in order to ameliorate their research performances and reputation as well as the performances of their affiliated professors.

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