

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today
(1) was not written for publication in a law journal and
(2) is not binding precedent of the Board.

Paper No. 15

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN E. CUNNINGHAM, and
WON-TIEN TSANG

Appeal No. 95-3055
Application 08/111,765¹

ON BRIEF

Before KRASS, TORCZON, and CARMICHAEL, Administrative Patent
Judges.

KRASS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the final rejection of
claims 2 through 12, all of the claims pending in the
application.

The invention pertains to doping semiconductor materials in
such a manner to permit the tailoring of the activation energy of

¹ Application for patent filed August 25, 1993. According to
appellants, this application is a continuation of Application
07/774,671, filed October 11, 1991.

the dopant atoms making it possible to attain useful doping levels in materials heretofore unable to attain such levels.

Independent claim 11 is reproduced as follows:

11. An article that comprises a multilayer semiconductor structure comprising, in sequence, a first layer of thickness t_1 of a first semiconductor material, a second layer of thickness t_2 of a second semiconductor material, and a third layer of the first semiconductor material, with the first and third layers being essentially undoped, and the second layer comprising dopant atoms that provide charge carriers to said first and third layers, with the first semiconductor material differing in chemical composition from the second semiconductor material;

associated with the first semiconductor material being a first and a second band edge energy and an activation energy E_{A1} of said dopant atoms;

associated with said second semiconductor material being a third and a fourth band edge energy, with said first, second, third and fourth band edge energies being such that there exists a band edge offset in at least one of the conduction or valence band of the semiconductor body; and associated with each dopant atom in the second layer being a wave function and a Bohr radius r_B ;

CHARACTERIZED IN THAT

(a) t_2 is at most $2r_B$, and the dopant atoms are located such that the wave function of any given dopant atom extends into at least one of said first and third layers, such that said charge carriers experience Coulomb attraction to said dopant atoms, and associated with said charge carriers is an effective activation energy E_{Aeff} ; and

(b) t_1 , t_2 , and the first and second semiconductor materials are selected such that E_{Aeff} is less than E_{A1} , and t_1 is much greater than t_2 such that the multilayer semiconductor structure behaves substantially as if the dopant atoms were present in uniform first semiconductor material.

The examiner relies on no references.

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Claims 2 through 12 stand rejected under 35 U.S.C. ' 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as their invention.

Reference is made to the brief and answer for the respective positions of appellants and the examiner.

OPINION

We reverse.

The particular language in claim 11 which the examiner finds indefinite is: "associated with each dopant atomYa wave function...wave function of any given dopant atom extends into..." and "t1 is much greater than t2 such that...behaves substantially as if the dopant atoms were present in uniform first semiconductor material." The examiner's apparent position is that there is only one wave function for the totality of charge carriers and it is indefinite and inaccurate to imply, as the examiner apparently thinks the instant claim language does, that there are separate wave functions for each carrier and that some particular carrier is bound to some specific dopant atom.

In our view, the examiner's rationale is short on specifics as to what, exactly, is indefinite about particular claim language. In any event, to whatever extent the language "wave function of any given dopant atom" may appear, at first, to be a bit awkward, appellants have explained its meaning by evidence

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via an affidavit of an expert in the field. More particularly, of record is an affidavit by Dr. Serge Luryi, filed April 1, 1994. We find that Dr. Luryi is clearly an expert in the field of semiconductor devices in view of his education, degrees, authorship, research, patents and experience set forth on pages 1-2 of the affidavit. While Dr. Luryi's unsubstantiated statements, at page 2 of the affidavit, regarding enablement, are not relevant to the issue of definiteness under 35 U.S.C. ' 112, second paragraph, we find his statements, at pages 2-3 of the affidavit, regarding the meaning of specific claim language, to be particularly relevant and enlightening. More particularly, Dr. Luryi states that it is "common and accepted practice among semiconductor device physicists to refer to the 'wave function of a dopant atom'." Further, Dr. Luryi states that those skilled in this particular art "know that this language stands for 'the wave function of an electron or hole on the dopant atom,' as the case may be." At the top of page 3 of the affidavit, Dr. Luryi contends that:

It is an excellent approximation, and therefore customary in semiconductor device physics, to treat impurity (including dopant) atoms themselves as classical objects. Thus the term "wave function of the dopant atom" gives rise to no confusion among those skilled in the art, since all skilled practitioners understand this usage to refer to the wave function of the electron or hole, as the case may be.

Thus, while the claim language may not be as precise as the examiner would like,² we have evidence from an expert in the field that skilled artisans would have understood that claim language to mean what the examiner contends it does not mean.

Thus, we are faced with the situation wherein, on one hand, the examiner contends that certain claim language is indefinite because there can be no wave function of an electron or hole, only a wave function of a collection of electrons or holes, and, on the other hand, an expert in the field of semiconductor devices states that the "wave function of the dopant atom" refers to the "wave function of the electron or hole" and that these terms are well known and understood by those skilled in the art of semiconductor devices. The examiner offers no evidence to buttress his position and/or to contradict the averments of the expert. Therefore, we will not sustain the rejection of claims 2 through 12 under 35 U.S.C. ' 112, second paragraph, because, on balance, we find for appellants and we base our decision on the statements in the affidavit of Dr. Luryi regarding what skilled artisans would have understood the term "wave function of the dopant atom" to mean.

² We note that although the examiner contends that the language is indefinite, the examiner never offers an alternative or a specific suggestion as to what language would please the examiner.

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The examiner has accorded the Luryi affidavit little, if any, weight, contending that the statements therein are “[p]urely conclusory...without any factual basis therefor” [answer-page 5]. We find the examiner’s action in this regard to have been improper. The affidavit establishes Dr. Luryi as an expert in this field, and this is not gainsaid by the examiner. It is not understood how a statement by an expert as to what skilled artisans would have interpreted a term of art to mean is “[p]urely conclusory.” The “factual basis” for the conclusion as to what a particular term means is clearly the expert’s experience and education in the field.

The examiner also states that “Luryi admitted that the examiner’s rejection was correct” [answer-page 6]. However, we have carefully reviewed the affidavit and find no such admission.

We find no adequate basis for sustaining the examiner’s rejection of claims 2 through 12 under 35 U.S.C. ' 112, second

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paragraph, especially in view of the evidence provided by the Luryi affidavit. Accordingly, the examiner's decision is reversed.

REVERSED

Errol A. Krass)	
Administrative Patent Judge)	
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Richard Torczon)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
)	INTERFERENCES
)	
)	
James T. Carmichael)	
Administrative Patent Judge)	

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