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LLNL-TR-747179

Micro-Thin Lens Final Report

CRADA No. TC-0331-92

D. Sweeney, X. Zhang

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Micro-Thin Lens

Project Accomplishments Summary CRADA No. TC-0331-92

Date: January 20, 1998

Revision: 0

A. Parties

The project is a relationship between the Lawrence Livermore National Laboratory (LLNL) and CIBA Vision Corporation.

University of California
Lawrence Livermore National Laboratory
7000 East Avenue, L-795
Livermore, CA 94550

CIBA Vision Corporation, a Novartis Company
11460 Johns Creek Parkway
Duluth, Georgia 30097-1556

B. Background

The primary refractive human vision disorders are myopia, hyperopia, presbyopia, and astigmatism. In myopia (nearsightedness) and hyperopia (farsightedness) the image is formed either before or behind the retina and is corrected with lenses or by surgery. Astigmatism is caused by irregular curvature of the cornea and is corrected with either lenses or corneal sculpting. Presbyopia, or loss of accommodation, is the inability of the human lens to adjust its focal length and view objects in both near and far fields. This normally occurs as an individual ages and is usually corrected by bifocal lenses.

LLNL has developed the Micro-Thin Lens (MTL), which is a thin, color-corrected lens. This lens is generally less than a few hundred microns thick and flexible. It can be made bifocal and astigmatic, and is therefore a very attractive option for human vision correction. Since it is thin and flexible, the MTL is well suited for use as a contact lens.

C. Description

The general objective of the CRADA was to develop ophthalmic optical elements that are so thin that they can be placed on the human eye in revolutionary new ways. More specifically, the major accomplishment of this CRADA was to study the feasibility of producing a prototype optical element, in the form of a bifocal contact lens, for presbyopic vision correction.

LLNL has expertise, resources, and capabilities to solve complex optical problems as well as an infrastructure in microfabrication and thin film technologies to fabricate and test complex optical elements. The principal role of LLNL in the development of the bifocal contact lens was to provide optical design, fabrication and testing of thin optical elements.

CIBA Vision has extensive experience in psychophysical vision issues, optical strategies for vision correction, FDA approval processes, polymer materials, clinical trials, and commercial marketing and manufacturing. CIBA Vision's role in this project was to steer the MTL technology toward a product concept that leveraged the technical strengths of both

organizations. In addition, CIBA Vision provided the materials necessary for demonstrating concept feasibility.

As a result of the development of the basic concepts for a new bifocal contact lens device, CIBA Vision is prepared to advance this project from a seed program to a full-fledged pre-product development program. They have assembled an in-house team of full-time staff members to advance the goals of this project.

The next phase of this project requires the refinement of the recently conceived bifocal contact lens technology. The areas of refinement include optical design, materials development, and manufacturing. LLNL will be involved most intensely with the optical design, while providing consulting support to CIBA Vision on the materials development and manufacturing issues. In addition, CIBA Vision will begin a series of clinical trials to assess the device performance. Major hurdles in the refinement include reduction of optical aberrations and ease of manufacturing.

D. Expected Economic Impact

There are over 61 million persons in the US requiring vision correction for presbyopia. Approximately 6% are wearing bifocal contact lens alternatives currently on the market. On the other hand, in the vision correction population requiring only spherical correction, 33% are wearing contact lenses. It is CIBA Vision's goal to develop a new product that can have a large impact on the presbyopic market, raising the level of market acceptance to at least 33%.

E. Benefits to DOE

The refinement of the MTL technology embodies a new concept in the correction of chromatic aberrations in diffractive optics. If the MTL technology can be fully developed, LLNL will possess an important new technology that can be deployed in the design of compact optical systems.

The potential benefits to the defense programs are in two areas: 1) advanced optical instruments to be used in the stockpile stewardship program and 2) heads-up displays. Both areas require state-of-the-art technology for advanced optical designs.

F. Industry Area

Human vision correction.

G. Project Status

Project is poised to move from a seed program to pre-product development program with CIBA Vision funding most of the costs.

H. LLNL Point of Contact for Project Information

Don Sweeney
LLNL
Mail Stop L395
7000 East Avenue
Livermore, CA 94551

510 422-5877 Voice
510 422-8761 FAX

I. Company Size and Point(s) of Contact

CIBA Vision Corporation, a Novartis Company, has annual sales of 1.2 billion Swiss francs per year and 2600 employees worldwide.

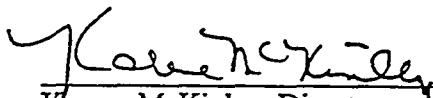
Xiaoxiao Zhang (770-418-3543, 770-418-3913 FAX) is Head of Eagle Advanced Research Program and Karen Handel (770-418-3555, 770-418-4256 FAX) is Director of Communications.

J. Project Examples

At this point, the development has concentrated on demonstrating concept feasibility; therefore, a fully functional prototype is not yet available.

K. Release of Information

I certify that all information contained in this report is accurate and releasable to the best of my knowledge.

 7/24/98

Karen McKinley, Director Date
Industrial Partnerships and Commercialization

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

 06/05/98

Xiaoxiao Zhang Date
Head of Eagle Advanced Research Program
CIBA Vision Corporation, a Novartis Company