

**IN THE UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF TENNESSEE  
GREENEVILLE DIVISION**

DENTSPLY INTERNATIONAL INC.  
and TULSA DENTAL PRODUCTS LLC  
d/b/a TULSA DENTAL SPECIALTIES

Plaintiffs,

v.

US ENDODONTICS, LLC

Defendant.

Civil Action No. 2:14-cv-00196  
Judge J. Ronnie Greer  
Magistrate Judge Dennis H. Inman

**HIGHLY CONFIDENTIAL**

**EXPERT REPORT OF ROBERT SINCLAIR, PH.D.**

**I. INTRODUCTION**

1. I, Robert Sinclair, Ph.D., have been retained by Plaintiffs Dentsply International Inc. and Tulsa Dental Products LLC d/b/a Tulsa Dental Specialties (collectively “Plaintiffs” or “Dentsply”) to serve as an expert witness in the above-captioned matter. I expect to testify regarding the matters discussed in this report as well as any supplemental report that I may later submit and to respond to any testimony that Defendant US Endodontics, LLC (“US Endo”) may offer at the preliminary injunction hearing.

**II. BACKGROUND AND QUALIFICATIONS**

2. I hold a B.A. in Materials Science (1968) and a Ph.D. in Materials Science (1972), both from Cambridge University. After receiving my Ph.D., I worked from 1973-1977 as a Postdoctoral Research Engineer at the University of California, Berkeley.

3. Since 1977, I have been employed at Stanford University in Stanford, California, where I have successively served as Assistant Professor in Materials Science and Engineering

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(1977-1980), Associate Professor with tenure in Materials Science and Engineering (1980-1984) and Professor of Materials Science and Engineering (1984 to Present). In 2009, I was appointed the Charles M. Pigott Professor in the School of Engineering at Stanford University.

4. Currently I am a Professor in the Materials Science and Engineering Department at Stanford University. I served as the chair of the Materials Science and Engineering Department at Stanford University from September 1, 2004 through August 31, 2014. From 2002 to 2013, I was the Director of the Stanford Nanocharacterization Laboratory, and from 2010-2012, I was the Director of the Bing Overseas Studies Program at Stanford University. I have had a number of appointments as a Visiting Professor at institutions around the world, including the HREM Laboratory at Cambridge University in the United Kingdom and Matsushita Electric Industrial Company in Japan.

5. I have authored more than 225 scientific research papers, published over 190 articles at national and international scientific meetings, and made over 500 presentations at conferences, university departments, and research laboratories world-wide. My publications, which are listed on my *curriculum vitae* attached hereto as Exhibit A, are in the areas of materials science, and include investigations on the properties of nickel-titanium alloys. I have also authored and/or edited several books and book chapters, and I hold two patents.

6. I have served as a member on the Editorial Board for the Journal of Applied Physics (1994-1996) and the Journal of Electron Microscopy (1996-present), among other journals. I routinely review articles for scholarly journals.

7. I have taught more than 6,000 students in undergraduate and graduate courses, including, among others, Introduction to Materials Science; Imperfections in Crystalline Solids; Atomic Arrangements in Solids; Nanostructure and Characterization; X-ray Diffraction

Laboratory; Nano-Characterization of Materials; Transmission Electron Microscopy; and Microscopic World of Technology.

8. My current research interests are in the structure-property-processing correlations in materials, using high-resolution microscopy and diffraction techniques, application to development of integrated circuit and magnetic recording materials and introduction of *in situ* high resolution electron microscopy. This includes their application to understanding phase transformations and deformation of nitinol alloys, correlated with Differential Scanning Calorimetry (DSC) analysis.

9. Throughout the course of my career, I have received various honors and awards, as described in detail my *curriculum vitae*. Some of the awards I have received include the *Robert Lansing Hardy Gold Metal* from the Metallurgical Society of AIME in 1976, the *Alfred P. Sloan Foundation Fellowship* in 1979, the *Distinguished Scientist Award* (Physical Sciences) from the Microscopy Society of America in 2009, and the *David M. Turnbull Lectureship Award* from the Materials Research Society in 2012.

10. Based on my experience and qualifications, I am qualified to render opinions in the field of nickel-titanium alloys. I am an expert in the field of materials science and engineering, particularly in electron microscopy and material structure and phase transformations, with several well-cited articles on the behavior of nitinol alloys.

11. I have been retained by Rothwell, Figg, Ernst & Manbeck, P.C. as an expert witness in this litigation. I am being compensated at my regular consulting rate of \$600 per hour for time spent consulting, plus expenses. My compensation is not dependent on the opinions expressed or the outcome of this litigation. In addition, I am an independent consultant and am not connected in any way to the parties involved in this litigation.

12. I have not provided any expert testimony in the last four years.

### **III. MATERIALS REVIEWED**

13. The opinions expressed herein are based on data, documents, and information currently available to and reviewed by me. In forming my opinions, I have considered the documents and information cited herein and listed in Exhibit B, attached hereto. I have also relied on my education, background, and experience.

### **IV. LEGAL STANDARDS**

14. My opinions are based on the legal standards provided to me by Counsel. I understand that the following legal standards apply with respect to assessing patent infringement.

15. It is my understanding that the question of infringement must be considered on a claim by claim basis, that is, each claim must be considered individually, and that a patent claim may be directly infringed in two ways, either literally or under the doctrine of equivalents.

16. It is my understanding that to literally infringe a patent claim, an accused process or product must meet every element and limitation of the asserted patent claim.

17. It is my understanding that if a patent claim is not literally infringed because not every element and limitation is met, a patent claim may be infringed under the doctrine of equivalents if, for each and every claim element or limitation that is not literally present in the accused process or product, the accused process or product has an equivalent element or limitation. In order for an element to be deemed equivalent, a person having ordinary skill in the art must consider it to be insubstantially different from the claimed element. Two elements are deemed equivalent when (1) perform substantially the same function; (2) in substantially the same way; and (3) achieve substantially the same result.

18. I understand that certain determinations are to be analyzed from the perspective of a “person having ordinary skill in the art,” and that such a person would be involved with the technology at issue at the time of the claimed invention. Based on my review of the ‘033 patent and the ‘773 patent, my review of the materials relied on to prepare this report, and my own research and academic experience, I believe that a person of ordinary skill in the art would have a high-level understanding of nickel titanium alloys. Such a person would likely have a material science, metallurgy, or related BS or MS degree and several years of experience; or, a PhD or related advanced degree and a couple years of experience so as to understand the structural, chemical and mechanical properties that can be manipulated in nickel titanium alloy materials.

19. I understand that a person having ordinary skill in the art at the time of invention relates to the period of when the first patent application was filed. As applied to this case, I understand that the ‘341 patent and the ‘773 patent claim benefit to an application filed in 2004, making that the relevant period for understanding what a person having ordinary skill in the art would have known.

## **V. OPINIONS AND BASES THEREFOR**

20. I understand that an action for patent infringement has been filed against US Endo for the unlawful use of a process claimed in the ‘341 and ‘773 patents.

### **A. Background of the Technology**

21. Nickel titanium alloys containing an approximately 50:50 atomic ratio of nickel to titanium (known as “nitinol”) were first discovered at the Naval Ordnance Laboratory in 1959. In the 1970s, the first reports of using nitinol in dentistry appeared. *See, e.g.,* Andreasen *et al.*, *A use hypothesis for 55 nitinol wire for orthodontics*. *Angle Orthod.* 1972, 42(2), 172-177; Andreasen *et al.*, *Laboratory and clinical analysis of nitinol wire*. *Am. J. Orthod.* 1978, 73(2),

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