

## Supporting information

### **Microscopic vibrational circular dichroism on the forewings of a European hornet: Heterogenous sequences of protein domains with different secondary structures**

Hisako Sato,<sup>\*a</sup> Sayako Inoué,<sup>b</sup> Jun Yoshida,<sup>c</sup> Izuru Kawamura,<sup>d</sup> Jun Koshoubu<sup>e</sup> and Akihiko Yamagishi<sup>f</sup>

<sup>a</sup>Faculty of Science Ehime University, 1 2-5, Bunkyo-cho, Matsuyama, 790-8577 Japan,  
[sato.hisako.yq@ehime-u.ac.jp](mailto:sato.hisako.yq@ehime-u.ac.jp)

<sup>b</sup>Geodynamics Research Center, Ehime University, Matsuyama 790-8577, Japan

<sup>c</sup>Nihon University, Department of Chemistry, College of Humanities & Sciences, Setagaya-ku,  
Tokyo 156-8550, Japan

<sup>d</sup>Graduate School of Engineering Science, Yokohama National University  
Yokohama, 240-8501, Japan,

<sup>e</sup>JASCO Corporation, Ishikawa 2967-5, Hachioji Tokyo, 192-8537, Japan

<sup>f</sup>Faculty of Medicine, Toho University, 2 5-21-16 Oomori-nishi, Ota-ku, Tokyo, 143-8540, Japan

#### **Contents:**

- 1. Optical microscopy**
- 2. Polarized light microscopy**
- 3. Detailed IR and VCD mapping data**
- 4. IR and VCD maps for dorsal and ventral surfaces**
- 5. IR and VCD spectra of a left forewing**

## 1. Optical microscopy

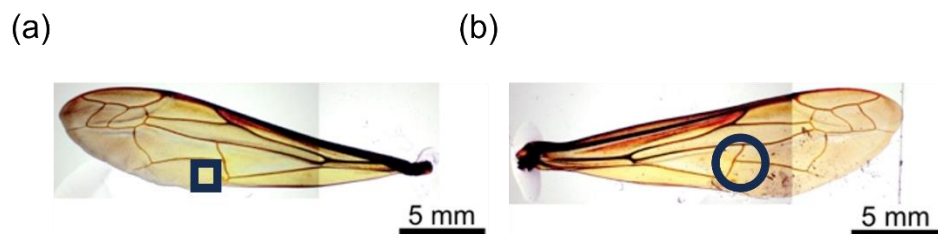


Figure S1. The images of left (a) and right (b) forewings of a European hornet by optical microscope, respectively. The images were taken from the dorsal sides. Regions indicated by square (a) and circle (b) were the areas measured by IR and VCD. For the measurements, the wings were sandwiched between  $\text{CaF}_2$  plates in an assembled cell.

## 2. Polarized light microscopy

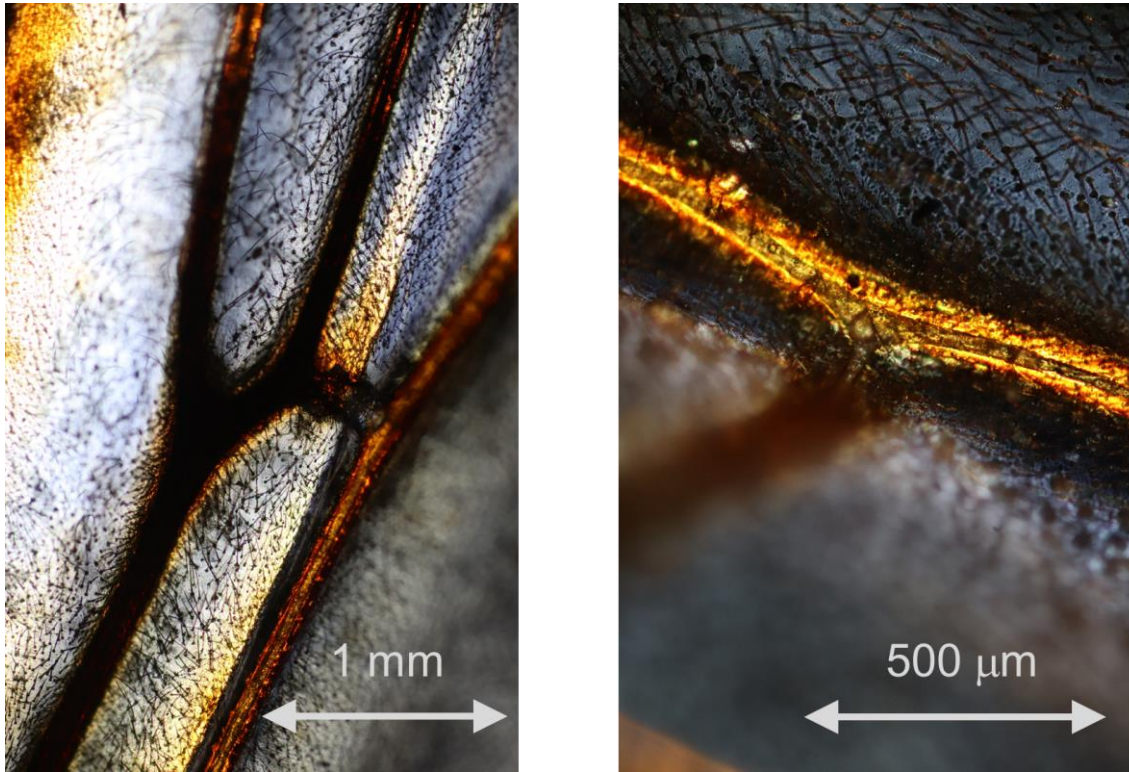


Figure S2. The polarized light microscope images of the vein crossing regions in the forewings of a European hornet: (left) a left forewing and (right) a right forewing, respectively.

### 3. Detailed IR and VCD mapping data

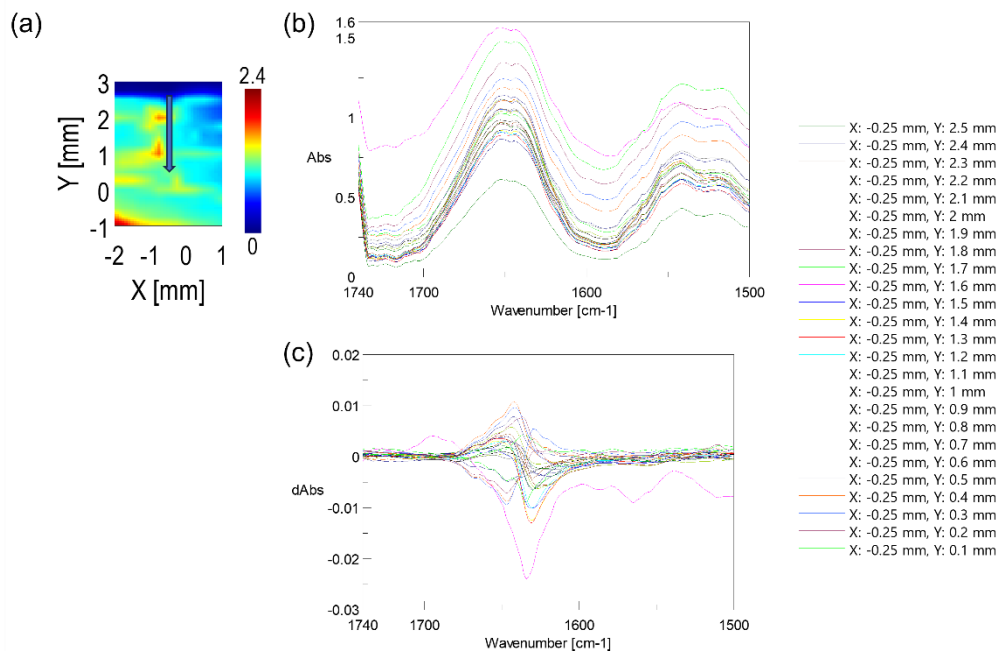


Figure S3. (a) IR map of a right forewing at 1650 cm<sup>-1</sup>. (b) A series of IR spectra when the measured position moved along the blue arrow in (a) from y = 0.1 to 2.5 mm at the constant value of x = -0.25 mm. (c) A series of VCD spectra when the measured position moved from y = 0.1 to 2.5 mm at the constant value of x = -0.25 mm.

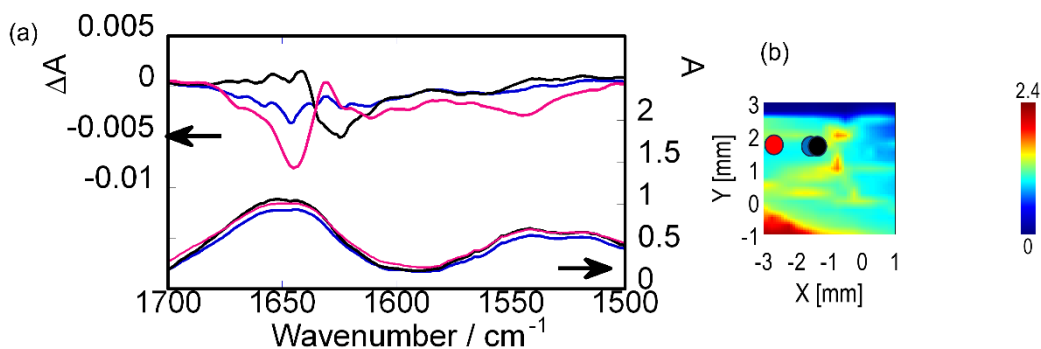


Figure S4. (a) IR (lower) and VCD (upper) spectra measured at the selected positions of a right forewing along the red arrow in Figure 2 (in the text). (b) The selected positions are indicated by red, blue and black circles, respectively. The coordinates at each position are following: black (-1.25, 1.75), red (-2.5, 1.75) and blue (-1.5, 1.75), respectively.

#### 4. IR and VCD maps of dorsal and ventral surfaces

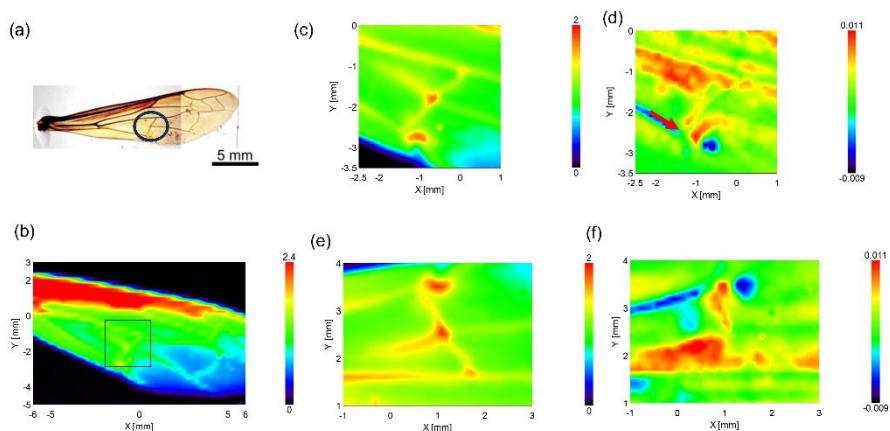


Figure S5. (a) The optical microscope image of the dorsal side of a right forewing of a European hornet. The circle indicates the measured region when the sample was sandwiched between two  $\text{CaF}_2$  plates in an assembled cell. (b) IR map of the dorsal side at  $1650\text{ cm}^{-1}$ . (c) IR map of the dorsal side around circle (a) at  $1650\text{ cm}^{-1}$ . (d) VCD map of the dorsal side at  $1648\text{ cm}^{-1}$ . (e) IR map of the ventral side in the right forewing around circle (a) at  $1650\text{ cm}^{-1}$ . (f) VCD map of the ventral side in the right forewing at  $1650\text{ cm}^{-1}$ .

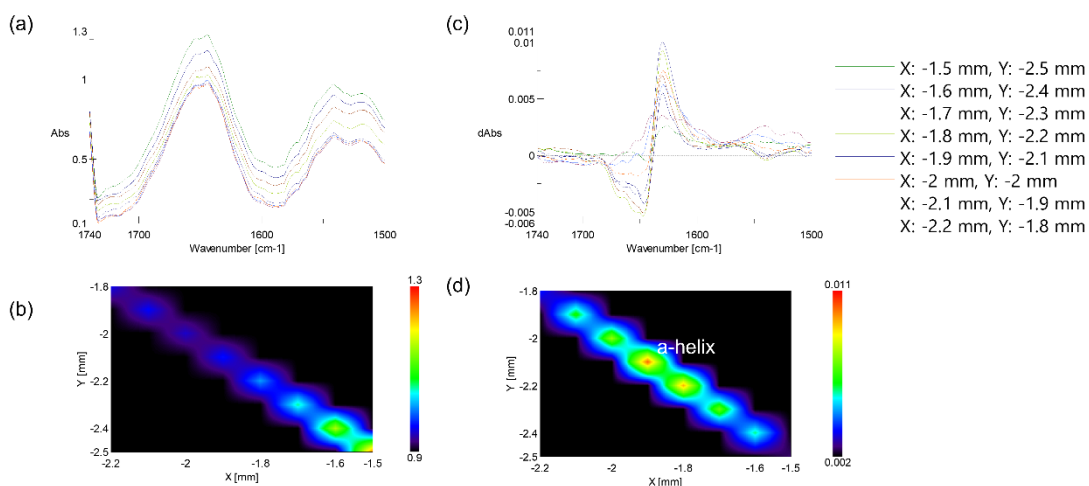


Figure S6. (a) A series of IR spectra measured on the dorsal side of a right forewing of a European hornet. (b) IR map of the dorsal side in a right forewing at  $1650\text{ cm}^{-1}$ . (c) A series of VCD spectra measured on the same positions as in (a). (d) VCD map at  $1630\text{ cm}^{-1}$  along the orange diagonal arrow on the dorsal side of a right forewing (Figure S5 (d)). Coordinates of measured positions are indicated at the right side.

## 5. IR and VCD spectra of a left forewing

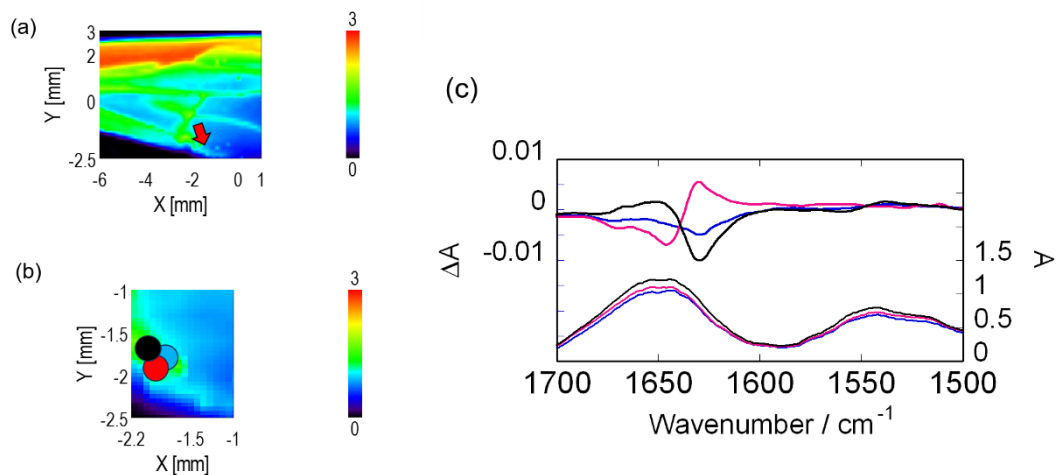


Figure S7 (a) IR map of a left forewing at 1650 cm<sup>-1</sup>. (b) The positions of the selected points for measurements. Their coordinates are following: black (-2.0, -1.7), red (-1.95, -1.9) and blue (-1.9, -1.8), respectively. (c) IR (lower) and VCD (upper) spectra measured at black, red, and blue circles in Figure S7 (b).