The EMPART research group is a multidisciplinary research unit. Its main activities lie in the electronics materials and devices, and nanotechnology focus areas of the University of Oulu. The group is a key player in the Center of Microscopy and Nanotechnology of the University of Oulu, where our overall target is to integrate nanostructures enabling novel functionality of electronic, telecommunication, bio/medical and energy/environmental devices.

The group comprises of specialists in microelectronic and nanoelectronic materials, mechanical engineering, measuring techniques, and also in chemistry and physics. The personnel consists of six professors, twelve post-doctoral researchers and 20 doctoral students.

The group was funded in 2013 by the University of Oulu, a European Research Council Advanced Grant to Professor Heli Jantunen, Tekes, the EU, the Academy of Finland, ERA.Net, and by domestic and foreign industry. Global research co-operation is a characteristic feature of the EMPART group, having key roles in several EU and other international projects.

In accordance with the long term research targets, we have continued the integration of interdisciplinary topics towards future advanced device and component implementations. In addition, a wide range of application areas utilizing the generic materials knowledge of the group have been of great importance from the application point of view. In 2013, the group leader Professor Jantunen was appointed as a Member of the World Academy of Ceramics (WAC) in recognition of her eminence in promoting progress in the field of ceramics science and technology.

The group co-operated in 2013 with other Infotech Oulu research groups as a partner in PrintoCent (Printed Electronics and Optical Measurements Innovation Center) having a printed electronics laboratory. National and international research co-operation included common projects and publications, and student, researcher and lecturer exchanges. The group also acknowledges Finnish and foreign industrial partners for their active participation in research projects.

Materials, components and technologies developed by the group are widely applied in the electronics industry, especially in wireless telecommunication, sensors/actuators and hybrid microelectronics technology. LTCC micro modules and printed electronics devices are important examples of present exploitation, together with recent scientific achievements in nanotechnology with applications. Novel materials, as well as our progress in fabrication have been utilized in antennas, sensors, ceramic/polymer integrations, filters, micro-pumps, lens and mirror positioning systems, energy harvesters etc. The number of scientific refereed journal publications was about 45.

### Personnel

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>professors, doctors</td>
<td>20</td>
</tr>
<tr>
<td>doctoral students</td>
<td>20</td>
</tr>
<tr>
<td>others</td>
<td>3</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>43</strong></td>
</tr>
<tr>
<td><strong>person years</strong></td>
<td>13</td>
</tr>
</tbody>
</table>

### External Funding

<table>
<thead>
<tr>
<th>Source</th>
<th>EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academy of Finland</td>
<td>125 000</td>
</tr>
<tr>
<td>Ministry of Education and Culture</td>
<td>120 000</td>
</tr>
<tr>
<td>Tekes</td>
<td>994 000</td>
</tr>
<tr>
<td>domestic private</td>
<td>439 000</td>
</tr>
<tr>
<td>international</td>
<td>893 000</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td><strong>2 571 000</strong></td>
</tr>
</tbody>
</table>

### Doctoral Theses


### Selected Publications

- Kumar N, Máki-Arvela P, Diáz SF, Aho A, Demidova Y, Linden


