

CURRENT DEVELOPMENTS IN MATERIALS SCIENCE IN ESTONIA

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Like in many other fields in Estonia and in the former Soviet Union, the results of materials science were largely subject to secrecy. Doctors' and candidates' dissertations, research reports, and authors' certificates were classified as "for institutional use" only. As a result, information concerning activities in the field of materials science and technology was scanty or inadequate.

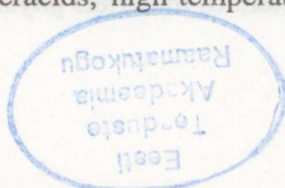
Over the recent three or four years, the picture has changed. An overview of the relevant research institutions and the programmes pursued in the field of materials science has become available. The academic and research institutions and their areas of research can be summarised as follows:

1. Tallinn Technical University (TTU)

- Department of Materials Technology (powder materials and powder metallurgy, semiconductor materials, coatings and surface technology, grinding and materials separation, and materials testing);
- Department of Chemical Engineering (conductive polymer coatings);
- Department of Polymeric Materials (polycondensation adhesives and recycling of polymeric materials);
- Centre for Materials Research (structural research of materials and development of structural research methods);
- Department of Building Production (cement and building materials);
- Department of Machine Science (methods of materials wear and instrument design);
- Department of Instrument Engineering (tribological systems and laser technology of materials).

2. University of Tartu (TU)

- Department of Physical Chemistry (electro-chemical technologies and new materials, superbases and superacids, high-temperature super-



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conductive materials, conductive polymers, polymeric and bioactive membranes, and thin films);

– Department of Experimental Physics and Technology (structural research of materials and films and development of X-ray analysis methods for materials research);

– Department of Organic Chemistry (Zn–Cu reagent-catalysts, bioactive aminoacids and peptides).

3. Institutes of the Estonian Academy of Sciences (EAS)

– Institute of Physics (emission and light sensitive materials, ordered and non-ordered solids, materials technologies and materials research methods);

– Institute of Chemical and Biological Physics (high-temperature superconductive materials, superbases and superacids, polymeric materials research, and catalysts);

– Institute of Energy Research (plasma-technology of materials and heat transfer surfaces);

– Institute of Chemistry and other institutes.

According to the nomenclature established by the Estonian Science Foundation (ESF), materials science is classified as an engineering science. This classification covers primarily materials science and technology dealing with engineering materials (industrial materials). A substantial part of materials science grants, in particular those for exact sciences, i.e., solid state and chemical physics; physical, analytical and organic chemistry, are allocated from the section of natural sciences.

During the recent four years, the grants for materials science, provided by the ESF from the section of engineering sciences, approximate 10% (Table). This proportion is similar to the share of materials science projects (11%) in the EUREKA programmes. The share of ESF grants for materials science is 2 % of the total science grants.

The share of materials science in ESF engineering science grants

	1993	1994	1995	1996
Total grants	12.8	10.1	10.7	9.2
Equipment excluded	8.2	9.2	8.9	–

According to the Law on Science Management and the reform of science and higher education, TU and TTU will become major centres of materials research through their competence centres to be established.

The following strategic materials research directions in Estonia can be outlined:

– in the field of materials chemistry: new materials based on solid superstrong superacids and superbases;

– in the field of materials physics: new sensors and memory materials;

– in the field of materials technology: engineering materials (development, testing, and recycling).

To achieve these goals, in the framework of Estonia's strategic materials science competence centre, strong materials science centres have to be established in Tartu and Tallinn.

To establish a materials science and technology centre at TTU, the following activities have to be accomplished:

– integration of the institutes of the EAS and departments of TTU in the field of materials science;

– development of priority programmes and technology transfer of materials science and technology;

– development of internationally acknowledged master and doctoral programmes.

The priority programmes of the materials science and technology centre at TTU will be as follows:

1. sensors and memory materials

– materials for solar energetics with the determined properties;

– conductive polymeric sensor materials;

2. development, testing, and recycling of engineering materials

– high wear-resistant composite materials and coatings based on refractory compounds;

– corrosion and corrosion protection of metals;

– polycondensation adhesives;

– materials recycling;

– development of methods for structural research of materials;

– development of methods for materials testing and instrument design;

– synthesis, structure, properties, and use of apatites.

In the near future, the goals of the competence centres of materials science in Estonia will be:

– to integrate intellectual potentials and material resources in the field of materials science and technology;

– to develop materials science projects in Estonia and achieve European standards through national and international research programmes;

– to seek international acknowledgement of the common TTU and TU master's and doctoral programmes;

– to develop an Estonian materials science and technology programme for 1996–2005 and activities to promote cooperation with industry;

– on these bases, to establish a faculty of materials technology at TTU.