Year	*Work Description*	*Associate*	*BS Manpower (ppy)*	*BS Hardware, Cons., Other Expenditure (kEuros)*	*PS Manpower (ppy)*	*PS Hardware, Cons., Other Expenditure (kEuros)*

ODSFS

	WP10-MAT-ODSFS-01-01/MEdC/BS Microstructure characterization of ODS ferritic steels (ODSFS) by (HR)TEM, X-EDS, EELS and APT. Specimens preparation, TEM (classical, not HRTEM) and X-EDS characterization of the microstructure and composition of ODS ferritic steels can be performed at NIMP-Bucharest. Composition determination by HRTEM, X-EDS and EELS; (HR)TEM and EELS data processing FIB samples preparation in order to be analysed by APT; APT raw data processing by 3D reconstruction are also in the scope of our capabilities. Collaborations with other laboratories like the Department of Materials at Oxford University - FIB sample preparation and APT analysis, the Department of Applied Materials Science at Katoelieke Universiteit Leuven - samples preparation by FIB and University of Barcelona, Spain - FIB samples preparation- would be very fruitful.	MEdC	0.50	1.00	0.00	0.00

	WP10-MAT-REMEV-01-01/MEdC/BS <u>Transmission and backscattering Mössbauer Spectroscopy studies of the short range order, structure and magnetic properties in α-Fe and binary Fe-Cr model-alloys.</u> <u>*Background*</u> The MössbauerSpectroscopy technique has been applied in physical metallurgy mainly for: 1) monitoring theeffect of deliberate modification of the metal by processing, eitherat the pre-treatment stage; 2) monitoring changesin the metal not caused deliberately, i.e. the side-effects ofprocessing (e.g. reactor steels, andphase transformation during intensive plastic deformation); 3) obtaining information to enable fundamental understanding of metalsand alloys (the formation of intermetallic phases in industrial alloys, the influenceof metal ions on iron oxide rusts and the studyof quasi-crystalline alloys etc). The information gained has helped the improvement ofproperties, the monitoring of changes in structures, as well asthe development of fundamental understanding of metals and alloys. <u>*Equipments*</u> We dispose of three Mössbauer spectrometers as follows: * *See Co. Mössbauer Spectroscopy system* (VT400 velocity transducer, W302 Mössbauer spectrometer, W202 Gamma Spectrometer, PC ; 4.5 to 300K closed Cycle He Refrigerator System for Mössbauer Spectroscopy, vacuum furnace for sample temperature from 300K to 800K, Mössbauer conversion electron detector); * *AME-50 Mössbauer spectrometer* (MVT-4 transducer, MDF-N-5 driver, MFG-N-5 generator, CMCA-550 Wissel acquisition system, Ortec gamma ray spectrometer, multifunctional detector for backscattering measurements by electron and X-ray);	MEdC	0.50	1.00	0.00	0.00

	* *AME-20 Mössbauer spectrometer* (MVT-2 transducer, MD-2 driver, PC with card as function generator and data acquisition system, Ortec gamma ray spectrometer, 80 to 500K MC-3 cryostat, vacuum furnace MF-2 for sample temperature from 300K to 1000K), radioactive sources for 57Fe, 119Sn and 151Eu isotopes, specialised programs for Mössbauer spectra analysis. Another Mössbauer spectrometer, with superconducting magnetic system, will be available in May 2010 for measurements at liquid helium temperature in the presence of strong magnetic fields (up to 6T). With regard the absorber preparation for Mössbauer spectroscopy, we dispose of the necessary know-how to approach a whole kind of samples, from powders to metallic samples and thin films. *Goals* We can contribute to the achievement of the following one or more of the following objectives: 1. Determination of Short Range Order (SRO) 2. Determination of local structure 3. Determination of magnetic properties aimed by the research project "MAT-REMEV: Radiation Effects Modelling and Experimental Validation" in the frame of the "Fusion Materials Topical Group".					

	WP10-MAT-REMEV-06-01/MEdC/BS In-situ TEM observation of dynamics of screw & edge dislocations and He bubbles in alpha-Fe and binary Fe-Cr model-alloys subjected to ion irradiation versus temperature. **Available equipments** We dispose of a JEOL 200 CX analytical transmission electron microscope provided with the following equipments and accessories: SIS-Olympus Keen View - 20 CCD camera for TEM image recording and processing via the iTEM software platform, IXRF EDS 2004 system for the chemical composition analysis, double-tilt specimen holder, single-tilt heating holder, single-tilt straining holder. In terms of TEM specimen preparation, we dispose of the necessary know-how and of a large variety of techniques and equipment allowing us to approach a whole lot of samples, from powders to metallic samples and thin films (plan view and cross-section): crushing, slicing with wire-saw, grinding and polishing for solid samples (Kent and MTI polishing machines), ion milling (Gatan PIPS and Gatan Duo Mill installations), electrochemical thinning (Struers machine). **Achievable tasks** With the described equipments we are able to perform in-situ heating or straining TEM studies of dislocations dynamics as well as to characterize the nanosized pinning centers such as preexisting precipitates and/or irradiation induced obstacles. We can contribute to the achievement of one or more of the following objectives of the research project "MAT-REMEV: Radiation Effects Modeling and Experimental Validation" in the frame of the "Fusion Materials Topical Group": 1. Experimental validation of dislocation dynamics properties	MEdC	0.50	2.00	0.00	0.00

	We are able to perform in-situ TEM observation of dynamics of screw and edge dislocation in binary Fe-Cr model-alloys versus temperature. 2. Screw dislocation mobility in presence of nanometric obstacles observed in TEM. Micromechanical testing of Fe model alloy. We are able to perform: TEM observation of mobility of screw dislocation in the presence of nanometre-size obstacles introduced by ion-beam irradiation; side effect and glide plain identification in micromechanical testing; effects of grain boundaries and C and Cr. 3. Primary damage in pure a-Fe & Fe-Cr alloys: identification of dislocation loops and He bubbles. We are able to perform TEM characterization of radiation damage and He bubbles in pure Fe and Fe(C, Cr) model alloys. **Group Expertise** Our group has got advanced expertise in TEM studies on iron and steels [1,2], in-situ TEM studies on phase transformations versus temperature [3-5], HRTEM studies on defects induced in Si by hydrogen plasma treatment [6,7]. **Collaboration** We are open to collaborate with any Association in the MAT-REMEV project involved in producing the alloys samples, irradiating the alloys samples or generating structural models to be compared with the microstructural results that we could provide by TEM studies.					

	WP10-MAT-WWALLOY-01-01/MEdC/BS Functional gradient W-steel materials by unconventional co-sintering routes Development of functional gradient materials with reduced activity by co-sintering powders of W and Eurofer steel, with the goal of establishing a correlation between the sintering conditions, number of layers and the structure of the final material. Different proportions of W-steel powders will be mixed (and/or mechanical alloyed) by ball milling. About 40 samples with 4 to 10 layers of these powders will be sintered by different routes using unconventional sintering like spark plasma, hot press or microwave. The composition and microstructure of the materials will be evaluated by SEM and EDX. Microhardness of the layers as well as other properties like specific heat (DSC, TG-DTA), thermal transport (Laser Flash technique) and electrical transport will be investigated at temperatures up to or above 1000 C. MEdC has available equipment for pulse plasma sintering (FCTSysteme, 2007), hot press sintering (MRF Inc., 2008) up to 2200 C, microwave sintering (Linn High Therm, 2008) up to 1700C, as well as classical sintering up to 2300 C.	MEdC	0.80	5.00	0.00	0.00