DEVELOPMENT OF A HIGH TOUGHNESS BAINITE IN A 38MnV7 STEEL

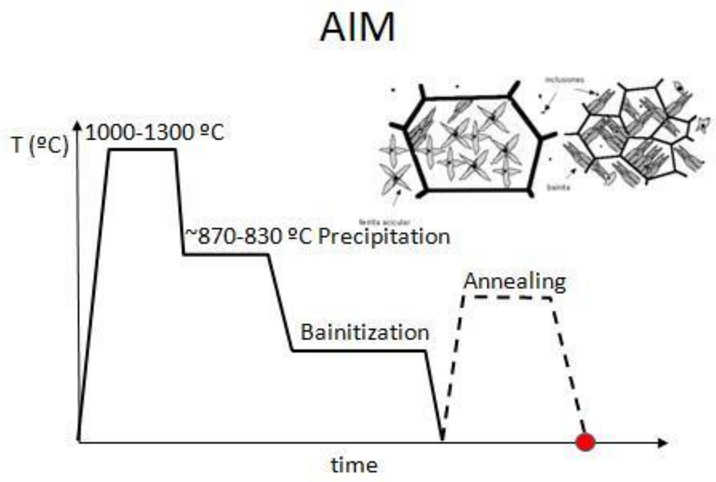
S.F. Medina[1], L. Rancel[1], M. Gómez[1], J. Calvo[2,3], A. Boulajaaj[2], A. Hernández[2], J.M. Cabrera[2,3]

[1]CENIM-CSIC, Spain, [2]Fundació CTM Centre Tecnológic, Spain, [3]Universidad Politécnica de Catalunya, Spain

SUMMARY

Previous works have shown that high toughness can be obtained in medium carbon bainitic steel (38MnV7) after a careful control of the chemistry and heat thermal treatment. Charpy-V tests at room temperature provided 40J for the steel after an isothermal bainitic treatment. Further improvement in toughness was obtained by subsequent tempering reaching an absorbed energy value of 50J with a FATT of -40ºC. Present work is oriented to an optimization of the above chemical composition.

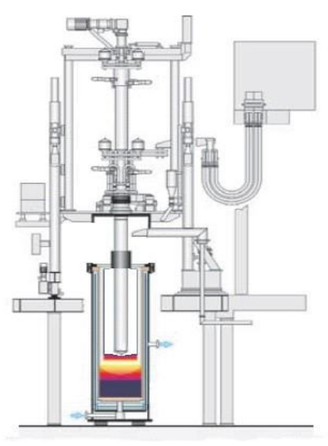
To attain this purpose six different casting were prepared, ranging the chemical composition as follows %C: 0.35-0.46, %Mn: 1.33-1.84, %V: 0.066 0.14% and %Ti: 0.010- 0.025. To appropriate design the thermomechanical cycle, precipitation curves, TTT curves (including the effect of the initial grain size, i.e. austenitization temperature , were determined for each steel



Chemical Composition

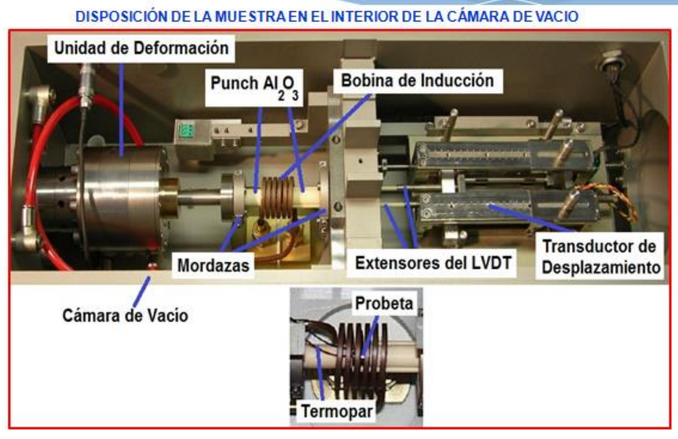
	C	Si	Mn	P	S	Al	Cu	Cr	Mo	V	Ti	N
MN8	0,36	0,27	1,7	0,012	0,024	0,013	0,29	0,18	0,038	0,097	<0.010	0,0152
MN9	0,37	0,26	1,66	0,012	0,029	0,012	0,29	0,18	0,039	0,14	<0.010	0,0131
MN10	0,35	0,23	1,45	0,012	0,041	0,01	0,32	0,18	0,039	0,086	0,018	0,0158
MN11	0,46	0,3	1,61	0,015	0,018	<0.003	0,24	0,037	0,014	0,096	<0.010	0,0171
MN12	0,43	0,27	1,84	0,016	0,017	0,003	0,24	0,037	0,014	0,082	<0.010	0,0155
MN13	0,43	0,25	1,33	0,015	0,027	0,002	0,24	0,037	0,014	0,066	0,025	0,0127

Electroslag remelting (ESR)

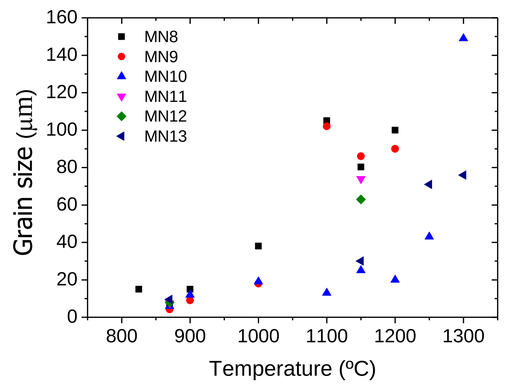


CENIM Facilities

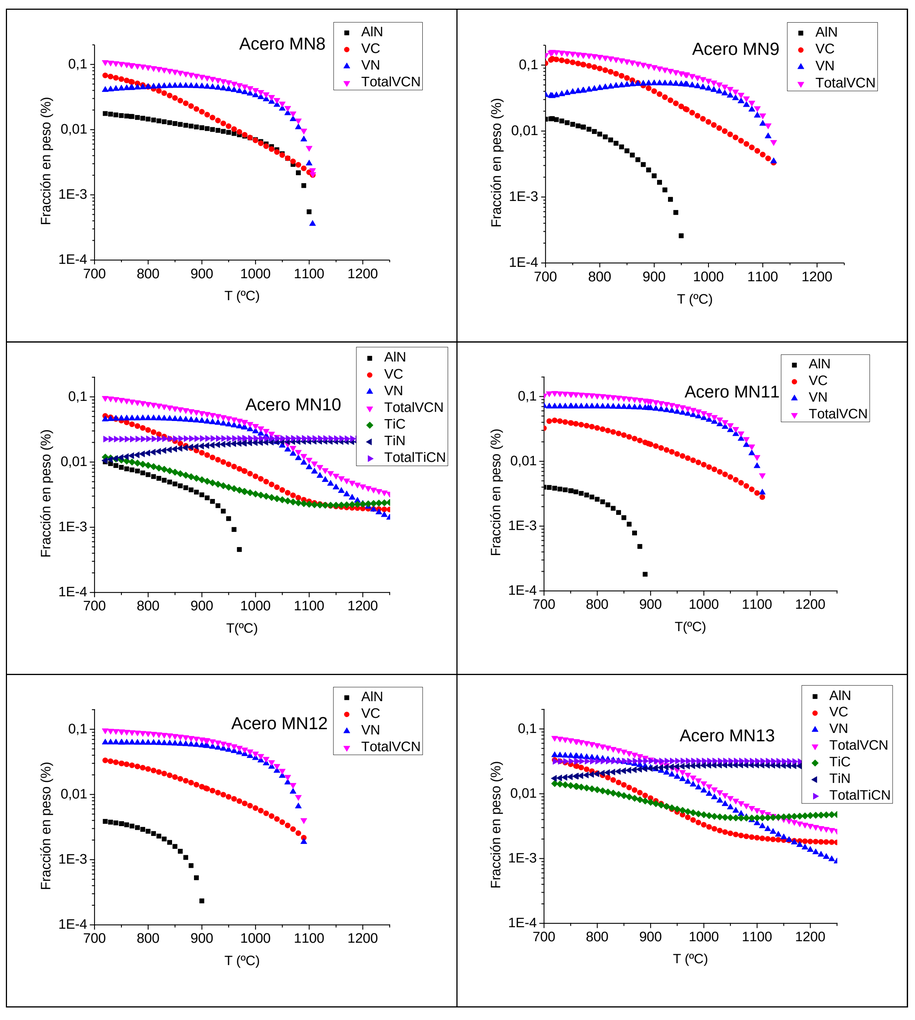
Quenching dilatometer



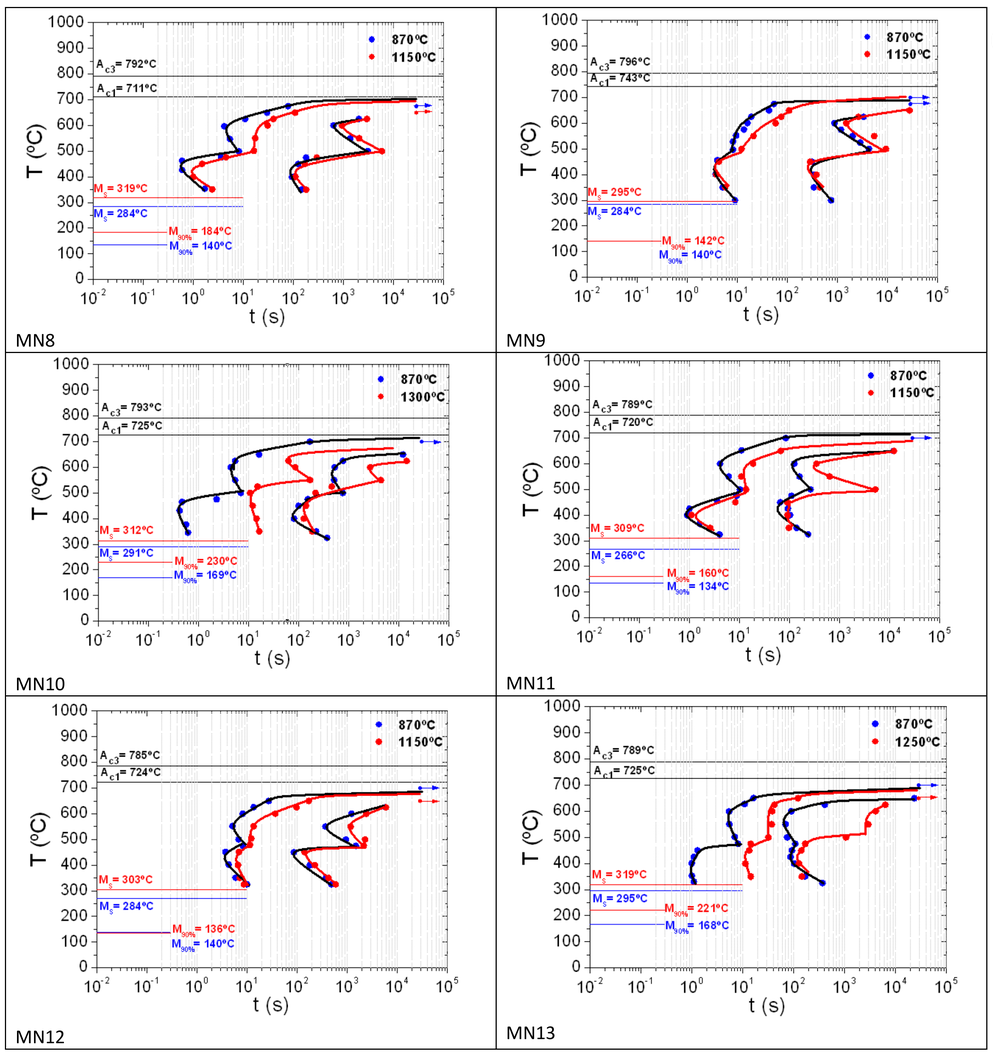
Initial grain size vs austenitization temperature



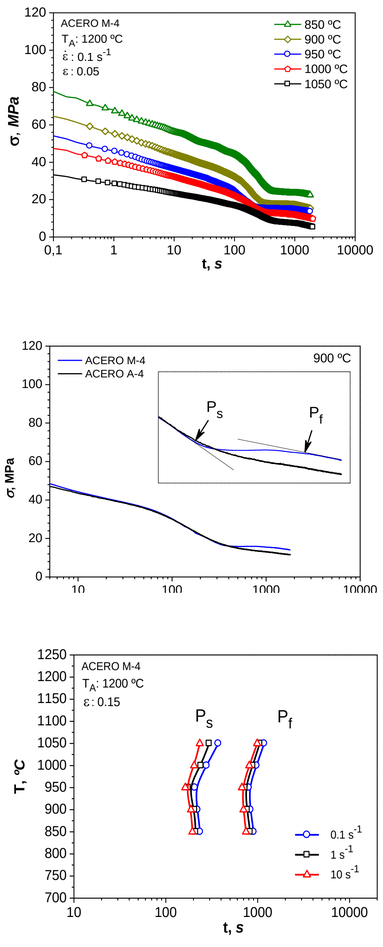
Equilibrium %wt fraction of precipitates derived by Factsage



TTT diagrams for each steel at two different initial grain sizes



On going work to derive PTT curves by the stress relaxation technique



ACKNOWLEDGMENT

The authors express their gratitude to the Spanish CICYT for funding the work thorough the project MAT2011-29039