

"FRACTURA DE COMPUESTOS POLIPROPILENO-TALCO"

Memoria presentada por José Ignacio Velasco Perero para optar al grado de
Doctor en Ciencias, especialidad Química.



BIBLIOTECA RECTOR GABRIEL FERRAT
Campus Nord

**DEPARTAMENT DE CIÈNCIES DELS MATERIALS I ENGINYERIA
METAL·LÚRGICA**

E.T.S.E.I.B.

UNIVERSITAT POLITÈCNICA DE CATALUNYA

BARCELONA, MAYO DE 1996

Fractura de Compuestos Polipropileno-Talco
BIBLIOGRAFÍA

8

CAPÍTULO 8

BIBLIOGRAFÍA

[Acosta, 1990]

Acosta A., Alia J.M, Prieto A.C. y Rull F., "*Caracterización estructural de talcos: aplicación a los talcos de Charches (Granada)*", Bol. Soc. Esp. Mineralogía, **13**, (1990) 61-68.

[Alonso, 1993]

Alonso M., González A., de Saja J.A., Requejo A., "*On the morphology of compression-moulded isotactic polypropylene filled with talc*", Plast. Rubb. Comp. Proc. Appl., **20**, (1993) 165-170

[Alonso, 1994]

Alonso M., *Tesis doctoral*, Universidad de Valladolid, 1994

[Alonso, 1996]

Alonso M., Velasco J.I., de Saja J.A., "*Constrained Crystallization and Activity of Filler in Surface Modified Talc Polypropylene Composites*", European Polymer Journal, (en prensa).

[Allard, 1989]

Allard R.C., Vu-Khanh T. and Chalifoux J.P., Polym. Compos., **10**, (1989) 62.

[ANAIP, 1995]

ANAIP, "*Los plásticos en el mundo*", El Boletín de ANAIP, **869**, (1995) p. 185.

[ASTM, 1969-a]

ASTM D-256, "*Test for impact resistance of plastics and electrical insulating materials*", Annual Book of ASTM Standards, 1969.

[ASTM, 1969-b]

ASTM D-638, "*Test for tensile properties of plastics*", Annual Book of ASTM Standards, 1969.

[ASTM, 1969-c]

ASTM D-647, "*Rec. practice of design of molds for test specimens of plastics molding materials*", Annual Book of ASTM Standards, 1969.

[ASTM, 1977]

ASTM Committee E-24, Task Group E24.01.09, "*Recommended procedure for J_{IC} determination*". Task Group Meeting in Norfolk, Virginia, USA, March 1977.

[ASTM, 1981]

ASTM E-813, "*Standard test method for J_{IC} , a measure of fracture toughness*". Annual Book of ASTM Standards. Part 10. American Society for Testing and Materials, Philadelphia, 1981, p. 810.

[ASTM, 1983]

ASTM E-399, "*Standard test method for plane-strain fracture toughness of metallic materials*", Annual Book of ASTM Standards, 1983.

[ASTM, 1987-a]

ASTM E-813, "*Standard test method for J_{IC} , a measure of fracture toughness*". Annual Book of ASTM Standards. Part 10. American Society for Testing and Materials, Philadelphia, 1987-a, p. 1968.

[ASTM, 1987-b]

ASTM E-1152, "*Standard test method for determining J-R curves*". Annual Book of ASTM Standards. Part 10. American Society for Testing and Materials, Philadelphia, 1987.

[ASTM, 1989]

ASTM E-813, "*Standard test method for J_{IC} , a measure of fracture toughness*". Annual Book of ASTM Standards. Part 10. American Society for Testing and Materials, Philadelphia, 1989, p. 700.

[ASTM, 1990]

ASTM D-1238, "*Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer*", Annual Book of ASTM Standards, 1990.

[Avrami, 1939]

Avrami M., "*Kinetics of phase change. I.- General Theory*", J. Chem. Phys., 7, (1939) 1103.

[Avrami, 1940]

Avrami M., "*Kinetics of phase change. II.- Transformation-time relations for random distribution of nuclei*", J. Chem. Phys., 8, (1940) 212.

[Avrami, 1941]

Avrami M., "*Kinetics of phase change. III.- Granulation, phase change and microstructure*", J. Chem. Phys., 9, (1941) 177.

[Begley, 1972]

Begley J.A. and Lands J.D., en "*Fracture Toughness*", ASTM STP 514, American Society for Testing and Materials, Philadelphia, 1972, pp. 1-20.

[Bramuzzo, 1985]

Bramuzzo M., Savadori A., Bacci D., Polym. Compos., 6, (1985) 1-8.

[Bridge, 1989]

Bridge B., Folkes M.J. and Jahankhani H., J. Mat. Sci., 24, (1989) 1479-1485.

[Brown, 1966]

Brown W.F. and Srawley J.E., "*Plane strain crack toughness testing of high strength metallic materials*", ASTM STP 410, 1966.

[Budiansky, 1965]

Budiansky B., J. Mech. Phys. Solids, 13 (1965) 223.

[Casiraghi, 1980]

Casiraghi T. and Savadori A., Plast. Rubb. Mat. Appl., February 1980, 1-6.

[Casiraghi, 1988]

Casiraghi T., Castiglioni G. and Ronchetti T., *"Fracture mechanics of polymers. Critical evaluation for linear elastic behaviour at high speed testing"*, J. Mat. Sci, 23, (1988) 459-466.

[Chan, 1983]

Chan M.K.V. and Williams J.G., Int. J. Fracture, 23, (1983) 145.

[Chen, 1989]

Chen L.S., Mai Y.W., and Cotterell B., Polym. Eng. Sci., 29, (1989) 505-512.

[Chen, 1992]

Chen Z., Finet M.C., Lidell K., Thompson D.P., White J.R., J. Appl. Polym. Sci., 46 (8), (1992) 1429-1437.

[Christensen, 1979]

Christensen R. M., J. Mech. Phys. Solids, 27 (1979) 315.

[Cohen, 1967]

Cohen L.J. and Ishai O., J. Comp. Materials, 1 (1967) 390.

[Coppola, 1986]

Coppola F., Greco R. and Ragosta G., *"Isotactic polypropylene/EPDM blends: Effect of testing temperature and rubber content on fracture"*, J. Mat. Sci., 21, (1986) 1775-1785.

[Cox, 1952]

Cox H.L. *"The elasticity and strength of paper and other fibrous materials"*, Br. J. Appl. Phys., 3, (1952) 72-79.

[Darlington, 1977]

Darlington M.W. and Smith G.R., "*Mechanical properties of glass fibre and mineral reinforced polyamides 6 and 6.6*", Reinforced Thermoplastics II, Plastics and Rubber Institute Conference, paper 12, 1977.

[Díaz, 1995]

Díaz M.R., *Tesis doctoral*, Universitat Politècnica de Catalunya, 1995.

[Dingle, 1974]

Dingle L.E., "*Aligned discontinuous carbon fibre composites*", Proceedings of the Fourth International Conference on Carbon Fibres, their Composites and Applications, paper 11, Plastic Institute, London, 1974.

[Dobрева, 1990]

Dobрева A. and Gutzow I., *Crys. Res. Technol.*, 25, (1990) 927.

[Dobрева, 1991]

Dobрева A. and Gutzow I., "*Kinetics of non-isothermal overall crystallization in polymer melts*" *Crys. Res. Technol.*, 26, (1991) 863-874.

[Dobрева, 1993-a]

Dobрева A. and Gutzow I., "*Activity of substrates in the catalyzed nucleation of glass-forming melts. I.- Theory*", *Journal of Non-crystalline Solids*, 162 (1-2), (1993) 1-12.

[Dobрева, 1993-b]

Dobрева A. and Gutzow I., "*Activity of substrates in the catalyzed nucleation of glass-forming melts. II.- Experimental evidence*", *Journal of Non-crystalline Solids*, 162 (1-2), (1993) 13-25.

[Dobрева, 1994]

Dobрева A., de Saja J.A., Velasco J.I., González M. and Alonso M. "*Flow behaviour of isotactic polypropylene filled with talc*", Proceedings of the Fourth European Rheology Conference, Sevilla, Sept. 1994.

[Dobrevá, 1995]

Dobrevá A., Alonso M., González M. and de Saja J.A., "A non-isothermal differential scanning calorimetry method for the determination of specific surface energies in polymer crystals", *Thermochim. Acta*, 2212, (1995) 1-8.

[Dutton, 1991]

Dutton A.G. and Mines R.A.W., "Analysis of the Hopkinson pressure bar loaded instrumented Charpy test using an inertial modelling technique", *Int. J. Fract.*, 51, (1991) 187-206.

[Dzenis, 1986]

Dzenis J. A., *Mekh. Kompoz. Mater.*, 1, (1986) 14.

[EGF, 1989]

EGF (European Group on Fracture) P1-90, "EGF recommendations for determining the fracture resistance of ductile materials", December 1989.

[EGF, 1990-a]

EGF (European Group on Fracture), "A Linear Elastic Fracture Mechanics (LEFM) Standard for determining K_C and G_C for plastics", Testing protocol, March 1990.

[EGF, 1990-b]

EGF (European Group on Fracture), "A testing protocol for conducting J-R curve tests on plastics", Protocol, July 1990.

[EGF, 1990-c]

EGF (European Group on Fracture), "Crack growth resistance curves for polymers. Development of a multiple specimen testing protocol", Protocol, October 1990.

[Elmendorp, 1995]

Elmendorp J.J. and Schoolenberg G.E., "Some wetting and adhesion phenomena in polypropylene composites" en "Polypropylene: Structure, Blends and Composites. Vol. 3". (Ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[ESIS, 1991]

ESIS, Technical Committee 4, "A testing protocol for conducting J-R curve tests on plastics", Testing protocol, March 1991.

[ESIS, 1992]

ESIS, Technical Committee 4, Meeting Les Diablerets -Switzerland, 6-8 May 1992, ESIS Newsletter, 19, 1992.

[Fatou, 1971]

Fatou J.G., "Melting temperature and enthalpy of isotactic polypropylene", Eur. Polym. J., 7, (1971) 1057.

[Fitchmun, 1969]

Fitchmun D.R. and Newman S., J. Polym. Sci., Polym. Lett. Ed., 7, (1969) 301.

[Fitchmun, 1970-a]

Fitchmun D.R., Newman S. and Wiggle R., J. Appl. Polym. Sci., 14, (1970) 2457.

[Fitchmun, 1970-b]

Fitchmun D. R. and Newman S., J. Polym. Sci., A-2, 8, (1970) 1545.

[Folkes, 1987-a]

Folkes M.J. and Wong W.K., Polymer, 28, (1987) 1309-1314.

[Folkes, 1987-b]

Folkes M.J. and Hardwick S.T., J. Mat Sci. Lett., 6, (1987) 656-658.

[Friedrich, 1978]

Friedrich K., Progress in Colloid and Polymer Science, 64, (1978) 103-112.

[Friedrich, 1979]

Friedrich K., Kunststoffe, 69, (1979) 796-801.

[Friedrich, 1981]

Friedrich K. and Karsch U. A., J. Mat. Sci, 16, (1981) 2167-2175.

[Friedrich, 1983]

Friedrich K., "Crazes and shear bands in semi-cristalline thermoplastics", en "Crazing in Polymers" (ed. H.H. Kausch), Springer-Verlag, Berlin, 1983, pp. 225-274.

[Fujiyama, 1991]

Fujiyama M. and Wakino T., J. Appl. Pol. Sci., 42, (1991) 2739-2747.

[Fujiyama, 1992]

Fujiyama M., Inter. Polym. Proc., VII, (1992) p. 2.

[Fujiyama, 1995]

Fujiyama M., "Higher order structure of injection-molded polypropylene", en "Polypropylene: Structure, Blends and Composites. Vol. 1". (Ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[Galán, 1978]

Galán E. y Rodas M., Bol. Soc. Española de Min., 0, (1978) 43-50.

[Galeski, 1980]

Galeski A. and Kalinski R., "Polymeric modifier for filled polypropylene", en "Polymer blends. Processing, morphology and properties. Vol 1". (Eds. E. Martuscelli, R. Palumbo and M. Kryszevski). Plenum Press, New York, 1980, pp. 431-449.

[Gray, 1974]

Gray D.J., J. Polym. Sci., Polym. Lett. Ed., 12, (1974) 509.

[Greco, 1986]

Greco R. and Coppola F., Plast. Rubb. Proc. Appl., 6, (1986) 35-41.

[Griffith, 1920]

Griffith A.A., "The Phenomena of Rupture and Flow in Solids", Phil. Trans. Roy. Soc., A221, (1920) 163.

[Gutowski, 1990]

Gutowski W., "Effect of fibre-matrix adhesion on mechanical properties of composites" en "Controlled interphases in composite materials", (Ed. H. Ishida), Elsevier, New York, 1990, pp. 505-520.

[Halpin, 1967]

Halpin J.C. and Tsai S.W., "Environmental factors in composite materials design", Air Force Materials Laboratory Technical Report, AFML-TR-67-423, 1967.

[Halpin, 1969]

Halpin J.C., "Stiffness and expansion estimates for oriented short fiber composites", J. Comp. Mater. 3, (1969) 732-734.

[Han, 1978]

Han C.D., Sandford C. and Yoo H.J., Polym. Eng. Sci., 18, (1978) 849.

[Han, 1981]

Han C.D., Van den Weghe T., Shete P. and Haw J.R., Polym. Eng. Sci., 21, (1981) 196.

[Hashemi, 1986]

Hashemi S. and Williams J.G., "Fracture characterization of tough polymers using the J method", Polym. Eng. Sci., 26, (1986) 760.

[Hashemi, 1991]

Hashemi S. and Williams J.G., "Single and multiple-specimen R-curve methods for J_{IC} determination of toughened nylons", J. Mat. Sci., 26, (1991) 621-630.

[Hashin, 1963]

Hashin Z. V. I. and Strikman S., J. Mech. Phys. Solids, 11, (1963) 127.

[Heredia, 1987]

Heredia A., *Tesis doctoral*, UPC, 1987.

[Hill, 1965]

Hill R., *J. Mech. Phys. Solids*, **13** (1965) 213.

[Hobbs, 1971]

Hobbs S. Y., *Nature, Phys. Sci.*, **234**, (1971), 12.

[Hobbs, 1972]

Hobbs S. Y., *Nature, Phys. Sci.*, **239**, (1972) 28.

[Hoffman, 1962]

Hoffman J. D. and Weeks J. J., "*Melting process and the equilibrium melting temperature of polychlorotrifluoroethylene*", *J. Res. Nat. Bur. Std.*, **66A**, (1962) 13.

[Hoffmann, 1982]

Hoffmann H., Grellmann W., Hille E. and Neue R., *Plaste und Kautschuk*, **4**, (1982) 230-237.

[Hornbogen, 1980]

Hornbogen E. and Friedrich K., *J. Mat. Sci.*, **15**, (1980) 2175-2182.

[Hull, 1987]

Hull D., "*Materiales compuestos*", Ed. Reverté, Barcelona 1987.

[Hutley, 1984]

Hutley T.J. and Darlington M.W., *Polymer Communications*, **25**, (1984) 226-228.

[Hutley, 1985]

Hutley T.J. and Darlington M.W., *Polymer Communications*, **26**, (1985) 264-267.

[Irwin, 1964]

Irwin G.R., App. Mats. Res., 3, (1964) 65.

[Ishai, 1967]

Ishai O. and Cohen L. J., Int. J. Mech. Sci., 9 (1967) 539.

[Ishida, 1984]

Ishida H. and Miller J.D., Macromolecules, 17, (1984) 1659-1666.

[Ishida, 1985]

Ishida H. "Structural gradient in the silane coupling agent layers and its influence on the mechanical and physical properties of composites" en "Molecular Characterization of Composite Interfaces" (Eds. H. Ishida and G. Kumar), Plenum Press, New York, 1985.

[Jancar, 1988]

Jancar J., Thesis, R.I.M.C., Chemopetrol, Brno (1988).

[Jancar, 1989-a]

Jancar J., "Influence of filler particle shape on elastic moduli of PP/CaCO₃ and PP/Mg(OH)₂ composites. Part 1. Zero interfacial adhesion" J. Mat. Sci., 24, (1989) 3947-3955.

[Jancar, 1989-b]

Jancar J., "Influence of filler particle shape on elastic moduli of PP/CaCO₃ and PP/Mg(OH)₂ composites. Part 2. Enhanced interfacial adhesion" J. Mat. Sci., 24, (1989) 4268-4274.

[Jancar, 1990]

Jancar J. and Kucera J., Polym. Eng. Sci., 30, (1990) 707-713.

[Jancar, 1991]

Jancar J., J. Mat. Sci., 26, (1991) 4123-4129.

[Jancar, 1992]

Jancar J., DiAnselmo A., DiBenedetto A. T., Polym. Eng. Sci., 32, (1992) 1394.

[Jancar, 1993-a]

Jancar J., DiAnselmo A., DiBenedetto A.T., Kucera J., *"Failure mechanics in elastomer toughened polypropylene"*, Polymer, **34**, No 8, (1993) 1684-1694.

[Jancar, 1993-b]

Jancar J., DiAnselmo A., DiBenedetto A.T., Polym. Eng. Sci., **33**, (1993) 1684.

[Jancar, 1993-c]

Jancar J. and DiBenedetto A.T., in "Proceedings of the 51st ANTEC SPE", Brookfield New Orleans, (1993) p. 1698.

[Jancar, 1994]

Jancar J. and DiBenedetto A.T., *"The mechanical properties of ternary composites of polypropylene with inorganic fillers and elastomer inclusions"*, J. Mat. Sci., **29**, (1994) 4651-4658.

[Jancar, 1995-a]

Jancar J. and DiBenedetto A.T., *"Effect of morphology on the behaviour of ternary composites of polypropylene with inorganic fillers and elastomer inclusions. Part I. Tensile yield strength"*, J. Mat. Sci., **30**, (1995) 1601-1608.

[Jancar, 1995-b]

Jancar J. and DiBenedetto A.T., *"Failure mechanics in ternary composites of polypropylene with inorganic fillers and elastomer inclusions. Part II. Fracture toughness"*, J. Mat. Sci., **30**, (1995) 2438-2445.

[Jha, 1986]

Jha N.K., Misra A.C. and Bajaj P., Polym. Eng. Sci., **26**, (1986) 332.

[Kalthoff, 1987]

Kalthoff J.F., *"On the measurement of dynamic fracture toughnesses- a review of recent work"*, Int. J. Fract., **27**, (1987) 277-298.

[Kantz, 1973]

Kantz M.R. and Corneliussen R.D., J. Polym. Sci., Polym. Lett. Ed., 11, (1973) 279.

[Karger-Kocsis, 1989]

Karger-Kocsis J. and Friedrich K., Int. J. Fatigue, 11, (1989) 161-168.

[Karger-Kocsis, 1991]

Karger-Kocsis J., J. Polym. Eng., 10, (1991) 97-121.

[Karger-Kocsis, 1993]

Karger-Kocsis J., "Microstructure-fracture toughness relationship of short fiber-reinforced PP homopolymer and PP/elastomer blends", J. Polym. Eng., 12, (1993) 77-107.

[Karger-Kocsis, 1995]

Karger-Kocsis J., "Microstructural aspects of fracture in polypropylene and in its filled, chopped fiber and fiber mat reinforced composites", en "Polypropylene: Structure, Blends and Composites", Vol. 3, (ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[Kerch, 1990]

Kerch G.M., Irgen L.A., "Non-Isothermal crystallization kinetics of filled blends of polypropylene and low density polyethylene" J. Thermal Analysis, 36 (1990) 129-135.

[Kerner, 1956]

Kerner E.H., Proc. Phys. Soc. (B), 69 (1956) 802-808.

[Kinloch, 1983]

Kinloch A.J. and Young R.J., "Fracture behaviour of polymers", Appl. Sci. Publi. Ltd., London, 1983.

[Kowalewski, 1986]

Kowalewski T. and Galeski A., J. Appl. Polym. Sci., 32, (1986) 2919-2934.

[Lands, 1972]

Lands J.D. and Begley J.A, en "Fracture Toughness", ASTM STP 514. American Society for Testing and Materials, Philadelphia, 1972, p. 24.

[Levita, 1989]

Levita G., Marchetti A. and Lazzeri A., Polym. Compos., 10, (1989) 39-43.

[Lewis, 1970]

Lewis T.B. and Nielsen, L.E., J. Appl. Polym. Sci., 14, (1970), 1449.

[Lovinger, 1977]

Lovinger A.J., Chua J.O. and Gryte C.C., J. Polym. Sci.- Polym.Phys. Ed., 15, (1977) 641.

[Lovinger, 1980]

Lovinger A.J. and Williams M.L., J. Appl. Polym. Sci., 25, (1980) 1703.

[Maiti, 1990]

Maiti S.N. and Mahapatro P.K., Int. J. Polym. Mat., 14, (1990) 205-222.

[Maiti, 1991]

Maiti S.N. and Mahapatro P.K., J. Appl. Polym. Sci., 42, (1991) 3101-3110.

[Maiti, 1992]

Maiti S.N. and Sharma K.K., J. Mat. Sci., 27, (1992) 4605-4613.

[Martínez, 1988]

Martínez A.B., "Técnicas de Impacto de Materiales Plásticos y Compuestos", Ed. UPC, Barcelona, 1988.

[Martínez, 1993]

Martínez A.B., Gordillo A., Díaz M.R., MasPOCH M.LI., "Efectos dinámicos en impacto de polímeros", Anales de Mecánica de la Fractura, 10, (1993) 167-173.

[Martínez, 1994-a]

Martínez A.B., Maspoch M.Ll. y Díaz M.R., "*Análisis de la fractura y de la deformación plástica de mezclas multifásicas de polímeros*", *Anales de Mecánica de la Fractura*, 11, (1994) 297-302.

[Martínez, 1994-b]

Martínez A.B., Arnau J., Sánchez M., Díaz M.R., "*Impacto de plásticos. Parte I: Análisis estático*", *Información Tecnológica*, Vol 5, Nº 6 (1994) 11-18.

[Martínez, 1994-c]

Martínez A.B., Arnau J., Santana O., Gordillo A., "*Impacto de plásticos. Parte II: Impacto de baja energía*", *Información Tecnológica*, Vol 5, Nº 6 (1994) 19-24.

[Martínez, 1994-d]

Martínez A.B., Arnau J., Maspoch M.Ll., Fernández-Santín J.M., "*Impacto de plásticos. Parte III: Análisis dinámico*", *Información Tecnológica*, Vol 5, Nº 6 (1994) 25-31.

[Martínez, 1994-e]

Martínez A.B., Arnau J., Maspoch M.Ll., Velasco J.I., "*Impacto de plásticos. Parte IV: Parámetros de la fractura*", *Información Tecnológica*, Vol 5, Nº 6 (1994) 33-40.

[Mascia, 1974]

Mascia L., "*Los efectos de los aditivos en los plásticos*", p. 134, Index, Madrid, 1974.

[Maspoch, 1992]

Maspoch M.Ll., *Tesis doctoral*, Universitat Politècnica de Catalunya, 1992.

[McGenity, 1992]

McGenity P.M., Hooper J.J., Paynter C.D., Riley A.M., Nutbeem C., Elton N.J. and Adams J.M., "*Nucleation and crystallization of polypropylene by mineral fillers: relationship to impact strength*", *Polymer*, 33, No 24, (1992) 5215-5224.

[Menczel, 1983]

Menczel J. and Varga J., *Journal of Thermal Analysis*, 28, (1983) 161-174.

[Michler, 1988]

Michler G.H. and Tovmasjan J.M., *Plaste und Kautschuk*, **35**, (1988) 73-77.

[Mitsuishi, 1985]

Mitsuishi K., Kodama S., Kawasaki H., *Polym. Eng. Sci.*, **25**, (1985) 1069-1073.

[Monasse, 1995]

Monasse B. and Haudin J.M., "*Molecular structure of polypropylene homo- and copolymers*", en "*Polypropylene: Structure, Blends and Composites. Vol. 1*". (Ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[Morales, 1988]

Morales E. and White J.R., *J. Mat. Sci.*, **23**, (1988) 3612-3622.

[Murphy, 1987]

Murphy M.W., Thomas K. and Bevis M.J., *Plast. Rubb. Proc. Appl.*, **7**, (1987) 241-242

[Murphy, 1988]

Murphy M.W., Thomas K. and Bevis M.J., *Plast. Rubb. Proc. Appl.*, **9**, (1988) 3-16.

[Narisawa, 1989]

Narisawa I. and Takemori M.T., "*Fracture Toughness of Impact-Modified Polymers Based on the J-Integral*", *Polym. Eng. Sci.*, **29**, (1989) 671-678.

[Narkis, 1976]

Narkis M., *J. Appl. Polym. Sci.*, **20**, (1976) 1597.

[Narkis, 1978]

Narkis M., Nicolais L. and Joseph E., *J. Appl. Polym. Sci.*, **22**, (1978) 239.

[Natta, 1955]

Natta G., Pino P., Corradini P., Danusso F., Mantica E., Mazzanti G. and Moraglio G., *J. Am. Chem. Soc.*, **77**, (1955) 1708.

[Nicolais, 1971]

Nicolais L. and Narkis M., Polym. Eng. Sci., 11, (1971) 194.

[Nicolais, 1974]

Nicolais L. and Nicodemo L., Int. J. Polym. Mat., 4, (1974) 229-243.

[Nielsen, 1966]

Nielsen L.E., J. Appl. Polym. Sci., 10 (1966) 97.

[Nielsen, 1970]

Nielsen L.E., J. Appl. Phys., 41, (1970), 4626.

[Nielsen, 1972]

Nielsen L.E., "*Mechanical Properties of Polymers and Composites*" Vol. 2, Marcel Dekker, New York, 1972.

[Norton, 1985]

Norton D.R. and Keller A., Polymer, 26, (1985) 704.

[Orowan, 1948]

Orowan E., Repts. Prog. Phys., 12, (1948) 185.

[Ouederni, 1995]

Ouederni M. and Phillips P.J., "*Influence of morphology on the fracture toughness of isotactic polypropylene*", J. Polym. Sci., Polym. Phys. Ed., 33, (1995) 1313-1322.

[Padawar, 1970]

Padawar G.E. and Beecher N., Polym. Eng. Sci., 10, (1970) 185.

[Paris, 1979]

Paris P.C., Tada H., Zahoor A. and Ernst H., "*Elastic Plastic Fracture*", ASTM STP 668, Philadelphia, PA, (1979) p.5

[Paul, 1960]

Paul B., Trans. Met. Soc. AIME, 36, (1960) 218.

[Petermann, 1995]

Petermann J., "*Epitaxial growth on and with polypropylene*", en "Polypropylene: Structure, Blends and Composites" Vol. 1, (ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[Plati, 1975]

Plati E. and Williams J.G., "*The determination of the fracture parameters for polymers in impact*", Polym. Eng. Sci., 15, (1975) 470.

[Plueddemann, 1978]

Plueddemann E.P., "*Silane coupling agents*" en "Additives for plastics. Vol. 1." (Ed. R. B. Seymour), Academic Press, New York, 1978, pp.123-167.

[Plueddemann, 1980]

Plueddemann E.P and Stark G.L., SPI, 35th Ann. Tech. Conf. Reinf. Plast. 20-C, 1980.

[Plueddemann, 1982]

Plueddemann E.P., "*Silane coupling agents*" Plenum Press, New York, 1982.

[Pukánszky, 1988]

Pukánszky B., Turksányi B. and Tüdós F., "*Effect of interfacial interaction on the tensile yield stress of polymer composites*", en "Interfaces in Polymer, Ceramic, and Metal Matrix Composites", pp. 467-77 (ed. H. Ishida) Elsevier, New York, 1988.

[Pukánszky, 1989]

Pukánszky B., Fekete E. and Tüdós F., Makromol. Chemie, Macromol. Symposia, 28, (1989), 165-186.

[Pukánszky, 1992]

Pukánszky B., New Polymer Materials, 3, (1992), 205-217.

[Pukánszky, 1995]

Pukánszky B., "*Particulate filled polypropylene: structure and properties*", en "Polypropylene: Structure, Blends and Composites", Vol. 3, pp.1-70 (ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[Ramsteiner, 1984]

Ramsteiner F. and Theysohn R., *Composites*, 15, (1984) 121-128.

[Rice, 1968]

Rice J.R., *J. Appl. Mech.*, 35, (1968) 379.

[Richard, 1975]

Richard T.G., *J. Comp. Materials*, 9, (1975) 108.

[Riley, 1990]

Riley A.M., Paynter C.D., McGenity P.M, and Adams J.M. "*Factors affecting the impact properties of mineral filled polypropylene*" *Plast. Rubb. Proc. Appl.*, 14, (1990), 85-93.

[Rodas, 1980]

Rodas M., Galán E. y Laiglesia A., *Boletín Geológico y Mineralógico*, T. XCI-V, (1980) 639-644.

[Rooke, 1976]

Rooke D.P. and Cartwright D.J., "*Compendium of Stress Intensity Factors*", HMSO, London, 1976.

[Rybnikar, 1981]

Rybnikar F., "*Interactions in the system polyethylene-solid filler*", *J. Macromol. Sci. Phys.*, B19 (1), (1981) 1-11.

[Rybnikar, 1989]

Rybnikar F., "*Orientation in composite of polypropylene and talc*", *J. Appl. Polym. Sci.*, 38, (1989) 1479-1490.

[Rybnikar, 1991]

Rybnikar F., *"Interactions in the system isotactic polypropylene-calcite"*, J. Appl. Polym. Sci., **42**, (1991) 2727-2737.

[Sato, 1962]

Sato Y. and Furukawa, Rubber Chem. Technol., **35** (1962) 857.

[Sato, 1963]

Sato Y. and Furukawa, Rubber Chem. Technol., **36** (1963) 1081.

[Savadori, 1985]

Savadori A., Material und Technik, **13**, (1985) 212-224.

[Schlumpf, 1983]

Schlumpf H.P., Kunststoffe, **73**, (1983) 511-515.

[Schlumpf, 1990-a]

Schlumpf H.P., *"Modern aspects of fillers in polypropylene"*, 10th International Macromolecule Symposium, 20-21 September (1990), Interlaken, Switzerland.

[Schlumpf, 1990-b]

Schlumpf H.P., *"Physico-chemical aspects of fillers in polypropylene"*, Chimia, **44**, (1990-b) 359-360.

[Schultz, 1993]

Schultz J.M., Private Communication, University of Delaware, March 1993.

[Sjoerdsma, 1989]

Sjoerdsma S.D., Polym. Commun., **30**, (1989) p.106.

[Smith, 1976]

Smith J. C., Polym. Eng. Sci., **16**, (1976) 394.

[Sumita, 1982]

Sumita M., Ookuma T., Miyasaka K. and Ishikawa K., J. Appl. Polym. Sci., 27, (1982), 3059.

[Sumita, 1983-a]

Sumita M., Tsukumo Y., Miyasaka K. and Ishikawa K., J. Appl. Polym. Sci., 18, (1983) 1758.

[Sumita, 1983-b]

Sumita M., Shizuma T., Miyasaka K. and Ishikawa K., J. Macromol. Sci. Phys, (B) 22, (1983), 601.

[Sumita, 1984]

Sumita M., Tsukihi H., Miyasaka K. and Ishikawa K., J. Appl. Polym. Sci., 29, (1984), 1523.

[Sumpter, 1973]

Sumpter J.D. and Turner C.E., Int. J. Fract., 9, (1973), 320.

[Taranco, 1991]

Taranco J., Laguna O. y Collar E.P., "*Modificación superficial de talco para su utilización como refuerzo de matrices termoplásticas*", Rev. Plast. Mod., 416, (1991), 251-256.

[Thomas, 1976]

Thomas K., Meyer D.E., Plast. Rubb. Mater. Appl., 1, (1976) 35.

[Timoshenko, 1970]

Timoshenko S.P., "*Resistencia de materiales*", p.263., Espasa Calpe S.A., Madrid 1970.

[Timoshenko, 1982]

Timoshenko S.P. and Goodier J.N., "*Theory of Elasticity*", Mc Graw-Hill, Singapore 1982.

[Trotignon, 1986]

Trotignon J.P., Verdu J., De Boissard R., De Vallois A., "Polypropylene-mica composites" en "Polymer Composites" pp. 191-198 (Ed. B. Sedláček), W. de Gruyter, Berlin, 1986.

[Tsai, 1968]

Tsai S.W. and Pagano N.J. "Composite Materials Workshop" (eds. S.W. Tsai, J.C. Halpin and N.J. Pagano), Technomic, Stamford, CT, 1968, p. 233.

[UNE, 1976]

UNE (Norma española), "Determinación del contenido en cenizas de materiales plásticos", UNE 53-090, Marzo 1976.

[UNE, 1978]

UNE (Norma española), "Materiales plásticos. Determinación de la temperatura de reblandecimiento VICAT", UNE 53-118, 1978.

[UNE, 1979]

UNE (Norma española), "Materiales plásticos. Determinación de la temperatura de flexión bajo carga", UNE 53-075, Marzo 1979.

[Van der Poel, 1958]

Van der Poel, Rheol. Acta, 1 (1958) 198.

[Varga, 1989]

Varga J., Journal of Thermal Analysis, 35, (1989) 1891-1912.

[Varga, 1992]

Varga J., "Review of supramolecular structure of isotactic polypropylene" J. Mat. Sci., 27, (1992) 2557-2579.

[Varga, 1995]

Varga J., "Crystalline, melting and supermolecular structure of isotactic polypropylene", en "Polypropylene: Structure, Blends and Composites", Vol. 1, (Ed. J. Karger-Kocsis) Chapman & Hall, London, 1995.

[Velasco, 1993]

Velasco J.I., de Saja J.A., Martínez A.B., "*Comportamiento a la fractura de mezclas de polipropileno y talco*", Anales de Mecánica de la Fractura, 10, (1993) 174-180.

[Velasco, 1995]

Velasco J.I., de Saja J.A., Martínez A.B., "*Comportamiento a la fractura de mezclas de polipropileno y talco. Parte II: Aplicación de las técnicas de impacto instrumentado*", Anales de Mecánica de la Fractura, 12, (1995) 109-115.

[Velasco, 1996-a]

Velasco J.I., de Saja J.A., Martínez A.B., "*Influencia de la funcionalización del talco en la cristalización de compuestos polipropileno-talco*", Rev. Plást. Mod., 71(477), (1996) 271-278.

[Velasco, 1996-b]

Velasco J.I., de Saja J.A., Martínez A.B., "*Efecto de la interfase en la fractura de compuestos polipropileno-talco*", Rev. Plást. Mod., 71(478), (1996).

[Velasco, 1996-c]

Velasco J.I., de Saja J.A., Martínez A.B., "*Crystallization behaviour of polypropylene filled with surface-modified talc*", J. Appl. Polym. Sci., (en prensa).

[Velasco, 1996-d]

Velasco J.I., de Saja J.A., Martínez A.B., "*Fracture behaviour of untreated and silane-treated talc-filled polypropylene composites*". Enviado para su publicación a Fatigue and Fracture of Engineering Materials and Structures (1996).

[Vink, 1990]

Vink D., Kunststoffe, 80, (1990) 842-846.

[Vollenberg, 1986]

Vollenberg P.H.T., and Heikens D., "*The effects of particle size on the mechanical properties of composites*" en "*Composite Interfaces*", (Eds. H. Ishida and J. L. Koenig), Elsevier, New York, 1986, pp. 171-175.

[Vollenberg, 1989-a]

Vollenberg P.H.T., and Heikens D., "*Particle size dependence of the Young's modulus of filled polymers: 1. Preliminary experiments*" *Polymer*, **30**, (1989), 1656-1662.

[Vollenberg, 1989-b]

Vollenberg P.H.T., de Haan J. W., Van de Ven L. J. M. and Heikens D., "*Particle size dependence of the Young's modulus of filled polymers: 2. Annealing and solid-state nuclear magnetic resonance experiments*" *Polymer*, **30**, (1989), 1663-1668.

[Vu-Khanh, 1986-a]

Vu-Khanh T. and Fisa B., *Polym. Compos.*, **7**, (1986) 219-226.

[Vu-Khanh, 1986-b]

Vu-Khanh T. and Fisa B., *Polym. Compos.*, **7**, (1986) 375-382.

[Vu-Khanh, 1991]

Vu-Khanh T., *J. Therm. Compos. Mat.*, **4**, (1991) 46-57.

[Way, 1974]

Way J.L., Atkinson J.R. and Nutting J., *J. Mat. Sci.*, **9**, (1974) 293-299.

[Weeks, 1963]

Weeks J.J., "*Melting temperature and change of lamellar thickness with time for bulk polyethylene*", *J. Res. Nat. Bur. Std.*, **67A**, (1963) 441.

[Williams, 1964]

Williams J.G. and Ford H., *J. Mech. Eng. Sci.*, **6**, (1964) 405-417.

[Williams, 1978]

Williams J.G., *Adv. Polym. Sci.*, **27**, (1978) 67-120.

[Williams, 1984]

Williams J.G., "*Fracture Mechanics of Polymers*", Ellis Horwood, Chichester 1984.

[Williams, 1987-a]

Williams J.G., "*The analysis of dynamic fracture using lumped mass-spring models*", Int. J. Fract., **33**, (1987) 47-59.

[Williams, 1987-b]

Williams J.G. and Adams G.C., "*The analysis of instrumented impact test using a mass-spring model*", Int. J. Fract., **33**, (1987) 209-222.

[Wright, 1988]

Wright D.G.M., Dunk R., Bouvart D., Autran M., Polymer, **29**, (1988) 793-798.

[Wu, 1988]

Wu S., J. Appl. Polym. Sci., **35**, (1988) 549.

[Wunderlich, 1976]

Wunderlich B., "*Macromolecular Physics. Vol 2. Crystal nucleation, growth, annealing.*", p. 137, Academic Press, New York, 1976.

[Wunderlich, 1980]

Wunderlich B., "*Macromolecular Physics. Vol 3. Crystal melting.*", p. 35, Academic Press, New York, 1980.

[Wunderlich, 1990]

Wunderlich B., "*Thermal Analysis*", p. 418, Academic Press, USA, 1990.

[Xavier, 1984]

Xavier S.F. and Sharma Y.N., Angewandte Makromolekulare Chemie, **127**, (1984) 145-152.

[Xavier, 1986]

Xavier S.F. and Sharma Y.N., Polym. Compos., **7**, (1986) 42.

[Xavier, 1990-a]

Xavier S.F. Schultz J.M., Friedrich K., "Fracture propagation in particulate filled polypropylene composites", J. Mat. Sci., 25, (1990) 2411-2420.

[Xavier, 1990-b]

Xavier S.F. Schultz J.M., Friedrich K., J. Mat. Sci., 25, (1990) 2421-2427.

[Xavier, 1990-c]

Xavier S.F. Schultz J.M., Friedrich K., J. Mat. Sci., 25, (1990) 2428-2432.

[Xavier, 1991]

Xavier S.F., "Development of fine morphology in polypropylene composites" en "Two-phase polymer systems" p. 347-370 (Ed. L.A. Utracki), Hanser, Munich, 1991.

[Yashima, 1973]

Yashima S., Kanda Y., Sasaki T., Iijima M. and Saitó F., "Mechanical properties of brittle materials and their single fracture under dynamic loading", Kagaku Kogaku, 37(12), (1973) 1218-1226.

[Yue, 1991]

Yue C.Y. and Cheung W.L., J. Mat. Sci., 26, (1991) 870-880.



BIBLIOTECA RECTOR GABRIEL FERRATÉ
Campus Nord