



PUBBLICAZIONE, AI SENSI DELL'ART. 19 DEL D.LGS N. 33 DEL 14 MARZO 2013, MODIFICATO DALL'ART. 18 DEL D.LGS N. 97 DEL 25 MAGGIO 2016 COME INTEGRATO DALL'ART.1 C. 145 DELLA LEGGE 27 DICEMBRE 2019 N. 160, DELLE TRACCE D'ESAME STABILITE DALLA COMMISSIONE ESAMINATRICE DELLA SELEZIONE DI SEGUITO INDICATA NELLA RIUNIONE IN DATA 08/04/2025

TRACCE PROVA ORALE

BANDO N. 331.2 RIC STEMS

Selezione per titoli e colloquio ai sensi dell'art. 8 del "Disciplinare concernente le assunzioni di personale con contratto di lavoro a tempo determinato", per l'assunzione, ai sensi dell'art. 141 del CCNL del Comparto "Istruzione e Ricerca" 2019-2021, sottoscritto in data 18 gennaio 2024, di una unità di personale con profilo professionale di Ricercatore III livello, presso l'Istituto di Scienze e Tecnologie per l'Energia e la Mobilità Sostenibili STEMS (sede di Torino)

N.1. (NON ESTRATTA)

- 1) Il candidato descriva una o più tecniche per la caratterizzazione morfologica e strutturale di materiali polimerici.**
- 2) Il candidato esponga come la propria formazione e le proprie esperienze pregresse possano contribuire ad ottenere avanzamenti riguardo le tematiche oggetto del bando.**
- 3) Il candidato elenchi e descriva brevemente le principali applicazioni che fanno parte di Microsoft Office.**
- 4) Il candidato legga e traduca il seguente testo in inglese estratto dall'articolo di F. Luzi, et al. "Study of disintegrability in compost and enzymatic degradation of PLA and PLA nanocomposites reinforced with cellulose nanocrystals extracted from Posidonia Oceanica" Polymer Degradation and Stability, 121, 2015, 105-115.**

Nanocomposite films based on poly(lactic acid) (PLA) reinforced with cellulose nanocrystals extracted from Posidonia Oceanica plant were prepared by solvent casting method containing 1 or 3%wt of cellulose nanocrystals unmodified (CNC) and modified using a commercial surfactant (s-CNC). The modification improves the dispersion of CNC into the matrix. Enzymatic degradation using efficient enzyme proteinase K and disintegrability in composting conditions were considered to gain insights into the post-use degradation processes of the produced formulations. Results of visual, morphological and thermal analysis of enzymatic degradation studies confirmed that the selected enzyme preferentially degraded amorphous regions with respect of crystalline ones, while the crystallinity degree of the nanocomposite films increased during enzymatic degradation, as a consequence of enzyme action. The disintegration in composting conditions of different formulations was also investigated by means of visual and morphological analysis. The disintegrability in compost conditions showed that the formulations disintegrated in less than 14 days, in addition it has been proved that CNC modified with surfactant were able to promote the disintegration behaviour. The production of PLA based nanocomposites incorporating cellulose extract from marine wastes suggested the potential application of the proposed material for short-term food packaging with low environmental impact.

N.2. (ESTRATTA)

- 1) Il candidato descriva una o più tecniche per la caratterizzazione chimico-fisica di materiali polimerici.
- 2) Il candidato esponga come la propria formazione e le proprie esperienze pregresse possano contribuire ad ottenere avanzamenti riguardo le tematiche oggetto del bando.
- 3) Il candidato descriva che cosa è un browser ed indichi qualche esempio.
- 4) Il candidato legga e traduca il seguente testo in inglese estratto dall'articolo di Sarai Agustin-Salazar "From Nutraceuticals to Materials: Effect of Resveratrol on the Stability of Polylactide" ACS Sustainable Chem. Eng. 2014, 2, 1534–1542.

Resveratrol is a naturally occurring polyphenol, well known as a nutritional supplement due to its strong antioxidant properties associated with anti-inflammatory activity and possible prevention of cardiovascular diseases. In this work, the effect of resveratrol on thermal, thermo-oxidative, and photo-oxidative degradation of polylactide is reported in the frame of developing fully biobased polymer formulations. Characterization of PLA films by thermal

methods and photo-oxidative treatments demonstrated that resveratrol catalyzed high temperature transesterification reactions under inert atmosphere, whereas it efficiently inhibited the exothermal oxidative reactions of the polymer backbone. Low-temperature photochemical degradation experiments on PLA films allowed elucidating the stabilization mechanisms of the phenolic additive. Resveratrol is capable of slowing the oxidative chain reaction of PLA through a peroxy radicals scavenging mechanism, while it has little effect on the direct photolytical cleavage of the ester bonds. Moreover, direct resveratrol oxidation

as well as the reaction between the phenol and photo-oxidized polymer species yield secondary photoproducts, which are also able to protect PLA against photo-oxidation likely due to the UV screening effect of the formed chromophores. Resveratrol is thus proposed as an eco-friendly and biocompatible additive for a sustainable approach to the stabilization of PLA films in packaging and other applications.

N.3. (ESTRATTA)

- 1) Il candidato descriva una tecnologia di preparazione di compositi a matrice polimerica ed una tecnica di caratterizzazione meccanica di materiali polimerici.
- 2) Il candidato esponga come la propria formazione e le proprie esperienze pregresse possano contribuire ad ottenere avanzamenti riguardo le tematiche oggetto del bando.
- 3) Il candidato descriva che cosa è un sistema operativo ed indichi qualche esempio.
- 4) Il candidato legga e traduca il seguente testo in inglese estratto dall'articolo di Petkowicz et al. "Pectins from food waste: Extraction, characterization and properties of watermelon rind pectin" Food Hydrocolloids, 65, 2017, 57-67.

Fresh and lyophilized watermelon rinds were treated with boiling ethanol for pigment removal and then used to extract pectins giving rise to fractions FW and LW, respectively. The pectins were characterized by chromatographic and spectroscopic methods. Both pectins had a galacturonic acid content higher than 65%, meeting the commercial requirement. However, FW had a higher yield (19.3%) than LW (14.2%). The protein contents were 3.9 and 3.6% for FW and LW, respectively. FW and LW had a high degree of methyl-esterification (~60%) and low molar mass, 34,510 g/mol for FW and 40,390 g/mol for LW. The viscosity of 5% (w/w) aqueous solutions of watermelon rind pectins at 25 °C showed shear thinning behavior with a low shear Newtonian plateau of



~30 Pa s for FW and ~10 Pa s for LW. Mechanical spectra of FW and LW at 5% (w/w) at 25 °C showed a weak gel like behavior for both pectins. The dynamic surface tension, foaming ability and emulsifying properties of FW and LW were evaluated and compared with gum Arabic. FW and LW showed lower dynamic surface tension and higher foaming ability than gum Arabic at the same concentration. Emulsions were prepared with polysaccharides at concentrations ranging from 0.5% to 4% (w/w). The droplet size decreased for both pectins as the concentration increased. Values of surface weighted mean diameter $D[3,2]$ and volume weighted mean diameter $D[4,3]$ obtained for emulsions prepared with FW and LW were found to be similar to gum Arabic, which is well known for its emulsifying properties.

Il segretario

Donatella Duraccio